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THE PAPER INDUSTRY

A MONTHLY EDUCATIONAL JOURNAL NOVEMBER, 1933

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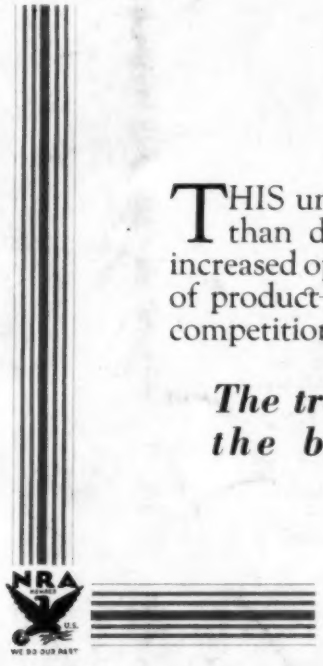
CRODON
The Chrome Plate
TRADE MARK REG. U.S. PAT. OFF.

LONG after ordinary equipment has been discarded, chromium-plated parts continue in regular operation. Protection against wear and corrosion does more than simply prolong useful life—it maintains new-equipment efficiency for extended periods.

THIS unusual performance means nothing less than drastically reduced costs, coupled with increased operating efficiency and improved quality of product—all important factors in the renewed competition for business.

The trade-mark CRODON assures the best in chromium plate

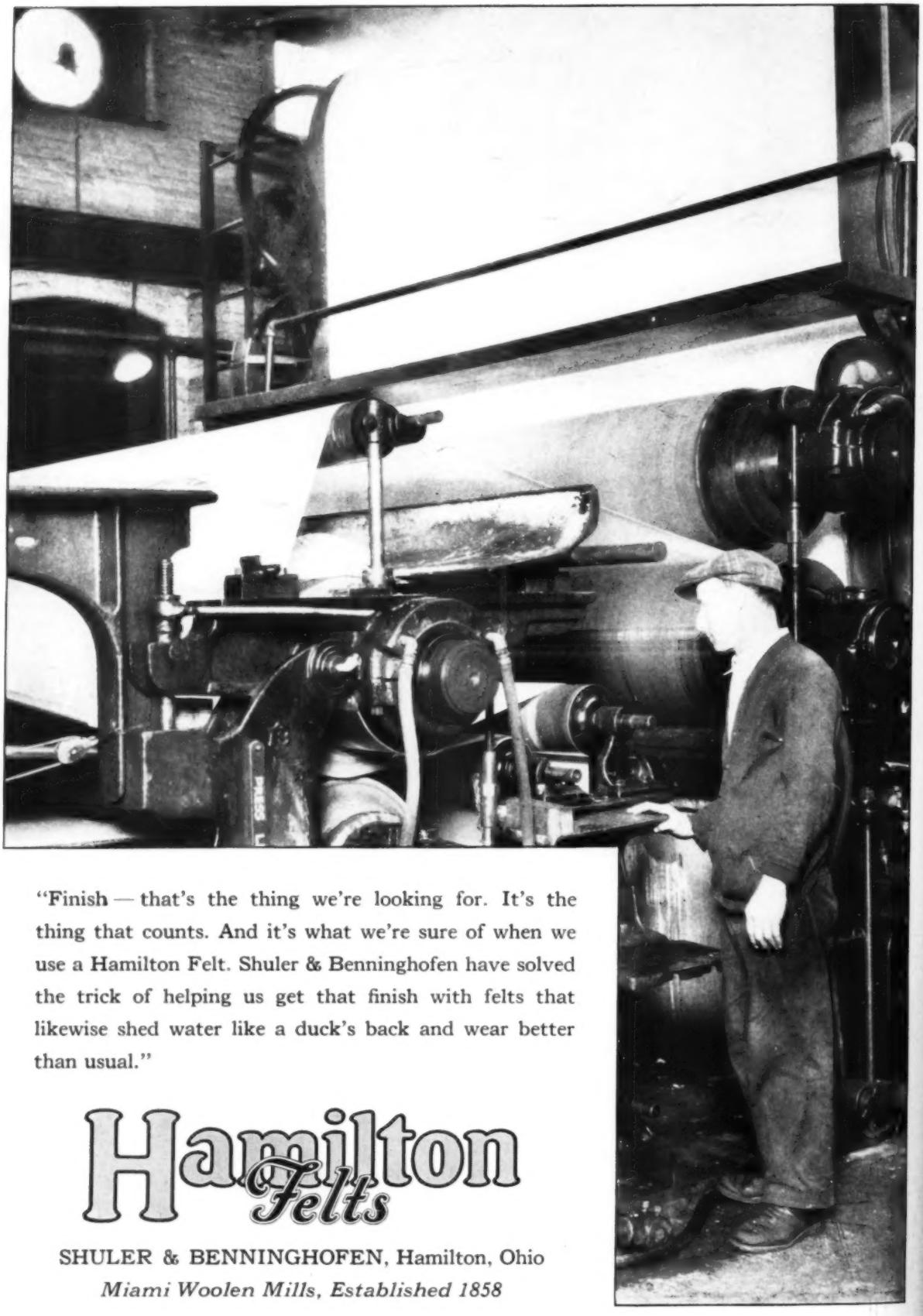


Your investigation of CRODON should be decidedly worth while, judging from the experience of many representative mills whose substantial cost-productions and trouble-free operations are consistently attained with the aid of CRODON plate.

Chromium Corporation of America

Executive Offices — 120 Broadway, New York

P. O. Box 1546, Waterbury, Conn. | 3125 Perkins Ave., Cleveland, Ohio | 4645 West Chicago Ave., Chicago, Ill. | 187 East Becher St., Milwaukee, Wis.



"Finish — that's the thing we're looking for. It's the thing that counts. And it's what we're sure of when we use a Hamilton Felt. Shuler & Benninghofen have solved the trick of helping us get that finish with felts that likewise shed water like a duck's back and wear better than usual."

Hamilton Felts

SHULER & BENNINGHOFEN, Hamilton, Ohio

Miami Woolen Mills, Established 1858

Paper Mill Bearings

that outwear bronze, resist chemical action, and fit without machining

Gatke Non-Metallic Bearings are made of a wonder material—it weighs 1/7 as much as bronze. The extreme accuracy of Gatke Bearings and their freedom from wear permits close gauging of machines and assures a more uniform finished product. Lubrication is no problem and scoring of shafts and journals is prevented.

For higher efficiency and lower operating cost, replace metal bearings and bushings in your mill with Gatke Non-Metallic Bearings. They outwear bronze ten to twenty times. They withstand high bearing pressures and are unaffected by ordinary acids, chemicals, solvents, or salt water. They are moulded under terrific pressure and take the place of metal bearings without mechanical changes. Reduce your maintenance expense and enjoy lower power consumption with these wonder bearings. Submit blueprints and dimensional data, and quotations will be cheerfully made. Address communications to:

GATKE CORPORATION

228 N. La Salle St., Chicago, Ill.
Manufacturers of Frictional and Anti-Frictional Products
Factories—Warsaw, Ind., and North Brookfield, Mass.

GATKE NON-METALLIC BEARINGS

THE PAPER INDUSTRY

NOVEMBER, 1933
Vol. XV—No. 8

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of the Pulp and Paper Industry

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RHOADS TANNATE

In Tannate Belts pliability, strength, grip and durability **are combined** in an unusual degree.

RHOADS TANNATE LEATHER BELTS

CORRECT SPEED AND COST SAVING

MR. HARRISON of the Crystal Tissue Company in a recent article on Technical Control, says, "Sometimes a comparatively inexpensive piece of equipment is slowing down the production of the whole unit," and again, "It is much easier to save a dollar than it is to earn another dollar." Two important production truths, well expressed.

The dependable power-transmitting capacity of Tannate Leather Belting can do much towards maintaining *correct speed;* while the greater first cost of Tannate, as compared with oak or rubber belting, has shown itself over and over again to be far outweighed by the higher efficiency secured on paper machines by its use.

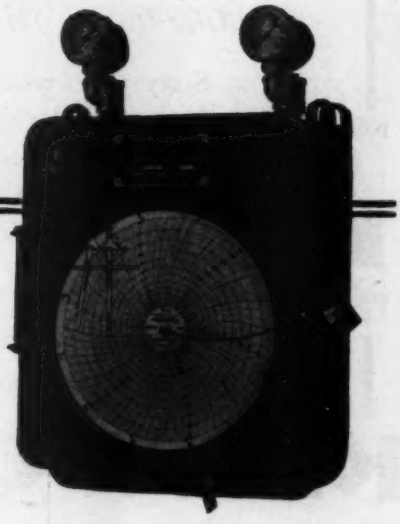
The maintenance man in a large New York State paper mill remarked that Tannate Belts have saved them a lot of expense and trouble. Other paper mill men have spoken of similar savings.

It pays to use Rhoads Tannate Watershed Belting.

SAVE BY MODERN GROUP DRIVES

J. E. RHOADS & SONS
PHILADELPHIA, 35 N SIXTH ST.
NEW YORK, CHICAGO, ATLANTA, CLEVELAND, WILMINGTON, DEL.

Increases wood pulp production of a grinder 8.9%



Automatic Control of grinder temperature by Taylor System wins over manual control in thorough test. This system is a profitable investment.

IS AUTOMATIC CONTROL of pulp grinders more efficient than hand operation? Will it increase wood grinder capacity?

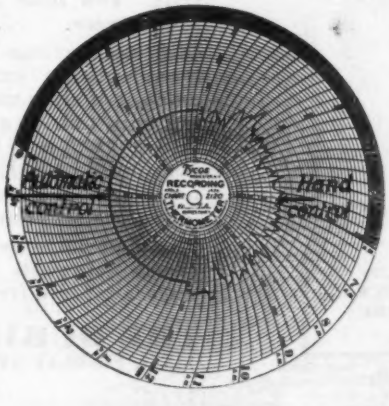
A large mill recently made a several weeks' test on a grinder to find out. Results of operation under manual control were recorded and compared with those obtained with use of a Taylor System of Automatic Grinder Temperature Control.

Automatic Control won. Production was increased 8.9%. Automatic Control not only increases the capacity of the grinder but also the quality of the pulp. Paper made from pulp produced under Taylor Control has a milled test 2 to 3 points higher than paper made from pulp produced under hand control of temperature.

Wouldn't you welcome such a record in your mill? The percentage would probably be different. But Taylor Temperature Control would surely produce an increase. It would assure finer stock at lowest cost. It would give you pulp more uniform in texture, freeness, color and strength. It would reduce your stone cost.

The Taylor Recording Temperature Regulator shown here is the heart of the Automatic Control. It maintains the desired temperature and also gives a daily chart record for your files. Its performance makes it an investment which starts paying dividends at once.

Let us give you full information on this Taylor System. Write Taylor Instrument Companies, Rochester, N.Y., U.S.A., or Taylor Instrument Companies, Ltd., Toronto, Canada.



The heart of Taylor Grinder Control is this Recording Regulator. This Taylor System was the first successful one of its type to be installed anywhere. Many installations in Canada and the U.S. are giving mills more efficient and economical grinding than they ever had before.

SPECIAL
TAYLOR NEWS FLASH

Beginning October 1st, all Taylor Temperature Recorders and Recording Regulators will be shipped in a new die-cast case originated by a noted American product designer. This modern case, with many distinct Taylor improvements in the mechanism of the instrument inside, represents another step in the effort to provide industry with the most up-to-date temperature and control equipment. More later.

Here is a typical chart record comparing the uncertain temperatures maintained under hand control and the practically perfect line made under Taylor Automatic Control.

† Tycos **Taylor** TEMPERATURE and PRESSURE INSTRUMENTS

† The name Taylor now identifies our complete line of products including Tycos instruments.

INDICATING · RECORDING · CONTROLLING

THERE ARE REASONS

Why KENWOOD tanned FELTS

CONTRIBUTE TO THE PRODUCTION OF QUALITY PAPER

NRA MEMBER U.S. WE DO OUR PART

KENWOOD WOOL PRODUCTS REG. U.S. PAT. OFF.

Sixty-three years of experience in the manufacture of Paper Maker's Felts is the background of their success.

Constant and careful inspection added to a deep seated knowledge of requirements make for perfection.

Constant testing of all material used and checking against fixed standards insure uniform quality.

The stock that goes into any given type of felt is the best that can be obtained.

Why experiment when absolute reliability is offered?

KENWOOD *tanned* FELTS

F. C. HUYCK & SONS

KENWOOD MILLS, ALBANY, N. Y.

KENWOOD MILLS LTD., ARNPRIOR, ONTARIO, CANADA

Manufacturers of Paper Maker's Felts Since 1870

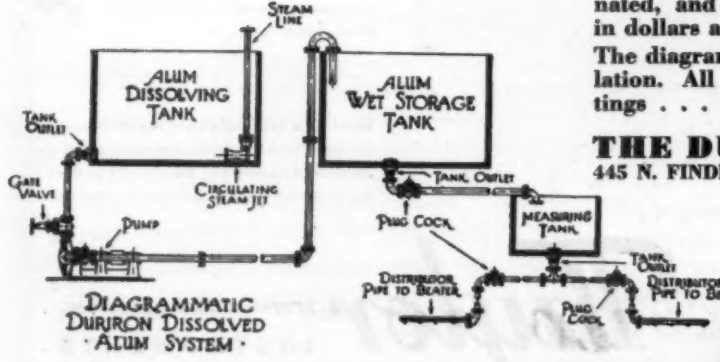
HOW MUCH IS A SHOVELFUL?

When you tell a beaterman to throw in so many shovelsful of alum, are you sure that he never makes a mistake?

If he puts in too much, the paper is brittle, and the excess alum corrodes the wires and deteriorates the felts. Too little alum results in poor sizing and weak paper.

With the Duriron Dissolved Alum System, the superintendent has exact control of the strength and amount of alum used. The gauge glass in the measuring tank tells at a glance how much alum has gone into the beaters. Labor and space are reduced, size precipitation is better, specks and spots are eliminated, and less alum is used . . . sizable savings in dollars and cents.

The diagram shows the features of a Duriron installation. All parts . . . pumps, valves, pipe and fittings . . . are free from any corrosion by the alum.



DIAGRAMMATIC DURIRON DISSOLVED ALUM SYSTEM

THE DURIRON COMPANY, Inc.

445 N. FINDLAY ST. DAYTON, OHIO

DURIRON

DISSOLVED ALUM SYSTEM

NOT HIGH HAT

. . . JUST HIGH GRADE

DU PONT BRILLIANT CROCEIN FL EXTRA CONC.

Gives practically no two-sided effect

THIS du Pont Dyestuff also possesses good solubility; yields brilliant shades, is very fast-to-light. Gives clear back waters even in heavy shades. Does not foam in the beater or on the machine.

Du Pont Brilliant Crocein FL Ex. Conc. is recommended for salmon pink shades in bonds, writings and other high grade sheets; also, for full brilliant scarlets and reds in cover and bag stocks.

Send for a sample today. Test this superior dyestuff in your own mill.

DU PONT DYESTUFFS
REG. U.S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., INC.
Organic Chemicals Department
Dyestuffs Division, Wilmington, Delaware

SALES OFFICES: Boston, Mass., Charlotte, N. C., Chicago, Ill., New York, N. Y., Philadelphia, Pa., Providence, R. I., and San Francisco, Calif. Represented in Canada by Canadian Industries, Ltd., Dyestuffs Division, Beaver Hall Building, Montreal, Que. and 372 Bay Street, Toronto, Ont.

Most Mills Are Paying for Several Fritz Refining Machines Every Year

A PAPER MILL superintendent said, on seeing a FRITZ REFINING MACHINE turning out more than three tons an hour of kraft fiber for board liner, that he felt this machine would do the work of from six to eight of their large beaters, and that it should pay for itself several times over during the first year. His officials, however, said they could not afford to spend the money, and yet that company, and most of the others, are losing several times the cost of this machine every year by keeping machinery that is obsolete and worn out, by excessive repair bills and unnecessary power costs.

When there is real competition, as now exists, it is only those mills that have had the foresight to install new and up-to-date equipment, which will enable them to turn out a better product than competitive mills can, and at a lower cost, that can make a profit.

The answer is the FRITZ REFINING AND HYDRATING MACHINE. If you want to make a better product and cut costs, write for further information.

Illustrating working principle of the Fritz Vertical Refining and Hydrating Machine, Gear driven type.

LOVE BROTHERS, Inc.
AURORA ILLINOIS

ALOXITE BRAND
REG. U. S. PAT. OFF.

PULP GRINDING WHEELS

ARE BUILT TO ORDER

Made to Meet the Conditions in Your Mill

EVERY wheel we turn out is made to meet certain, definite ground wood mill conditions.

Built to meet the specifications as applied to freeness, strength and screen classification of pulp.

There is no such thing as one wheel which will meet all demands. Every wheel is made with a definite purpose in view—made in the right grit and grade—to produce desired results.

The free, clean cutting action of this wheel plus its ability to remain sharp by holding its burring over extremely long operating intervals insure the production of high quality pulp and the continued duplication of that quality.

Points worth remembering in considering the problem of a greater production of better pulp

TUNE IN
THE CARBORUNDUM BAND
Saturdays at 9.30 E. S. T.
Columbia Chain

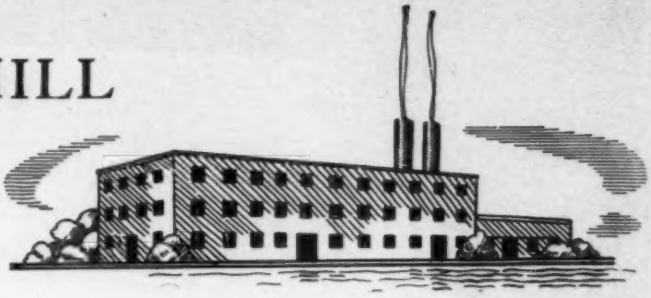
THE CARBORUNDUM COMPANY
REG. U. S. PAT. OFF.

NIAGARA FALLS, N. Y.

CANADIAN CARBORUNDUM CO., LTD., NIAGARA FALLS, ONT.

(CARBORUNDUM AND ALOXITE ARE REGISTERED TRADE MARKS OF THE CARBORUNDUM COMPANY)

Can your MILL *GROW under the new* RE-ADJUSTMENT?



★ Your mill—to grow—*must meet* industry's shorter working hours and higher wages.

One method is to lower present costs of mechanical production and sell your paper at increased prices.

The first demands higher production speeds—the latter, if sales volume is to be increased, a rigid control of quality.

When modernizing present machines, planning new machines for catalog, book, bond, ledger, condenser, tissue, etc., bring Smith & Winchester in on the picture.

You will get the benefit of the longest experience on fine paper machines: builders of the first American Fourdriniers—builders of the two widest Fourdriniers operating in the world today on the finest tissue paper.

HAVE you received your free copy of this bulletin? It tells of the latest S & W developments for paper mills. More than 183 mills have already requested copies. Ask for "Carrying the Torch."

★

The SMITH & WINCHESTER *Manufacturing Company*

81

PLANT AND OFFICES AT SOUTH WINDHAM, CONNECTICUT

We Shall Emerge Triumphant

GOLD is the basis of all human exchange. Control of the value of gold means control of all commodity exchange transactions.

The President of the United States on October 25 took control of the gold market in the United States, thereby establishing a domestic control over commodity valuation in this country and in large measure insuring domestic transactions, financial and commercial, a freedom from extra national catastrophic variations and political interferences—a much desired and a far-reaching stabilizing move, in our judgment already too long delayed.

It is well to keep in mind the significant summary of the President's address of Sunday night, October 22. It cannot be expressed better than in the President's own words:

"Our dollar is now altogether too greatly influenced by the accidents of international trade, by the internal policies of other nations, and by political disturbances in other countries.

"Therefore, the United States must take firmly in its own hands, the control of the gold value of our dollar. This is necessary in order to prevent dollar disturbances from swinging us away from our ultimate goal, namely, the continued recovery of our commodity prices.

"As a further effective means to this end, I am going to establish a government market for gold in the United States.

"My aim in taking this step is to establish and maintain continuous control.

"This is a *policy* and not an expedient."

On October 25, the United States gold market opened and United States values were set by the United States Government's announced open price per ounce, which it offered for gold, namely, $31.36. The control, therefore, of values in the United States passed from London, England, to Washington, D. C. Hence, October 25, 1933, financially and commercially, becomes an epochal date.

Do London and Paris recognize the far-reaching, history-making influence of this epochal change? They do.

Do the citizens of this country realize the momentous benefit to them that lies behind this change? Not yet—but they will.

We are still too provincial and too individualistic to accept the new order of things. We want the President and his advisors to show us just how and why they are going to put more dollars into our cash registers as was illustrated by the naive requests of certain large New York financial interests, that the Government amplify and disclose its course of future action, not realizing that such disclosure would defeat the beneficent operation.

You readers will recall that the world's economic conference at London this past summer broke down because neither London nor Paris would agree to our proposals to stabilize the pound, the franc and the dollar on what we considered to be an equitable stabilized parity to all concerned. England was at that time signing favored trade pacts with favored nations; she felt cocky.

France was slapping on increased prohibitive tariffs against our products. England had gone off the gold standard to enable her to grab the world trade advantages by the means of a devalued pound and control of the world's gold market.

Pretty soft for them. Their exports grew instantly, while ours showed steady declines.

They banked heavily upon the fact that Uncle Sam had never monkeyed with his dollar and was proud of his credit, and, moreover, would never, never challenge London's place in the commercial and financial sun—that of the arbiter and controller of the gold market of the world.

But your Uncle Sam parried the world's conference, bided his time, investigated shrewdly and carefully, and on October 25, in spite of all precedents, and in accordance with a determined "policy," set up his own gold market, and now, literally, hell's to pay in international trade.

England can't take the lead and become the world's buyer of gold. If she does, she will lose her trade.

Now, we are not prophets or sons of prophets, but we are willing to hazard a bunch of those prospective Russian kopecks we are flirting with, that before many days hence, if you watch current international events closely, a hurry-up conference will be held involving England, United States and France seeking the establishment of a stabilized parity for the pound, franc and dollar predicated upon the basis which Uncle Sam proposed at the London conference. Perhaps a better deal, involving also some substantial cash payments on war debts, repudiated by France and percented by England.

In the meantime, what of the steady, deadly, daily advance in the per ounce price of gold? Read them: October 25, $31.36; October 26, $31.54; October 27, $31.76; October 28, $31.82; October 30, $31.96; October 31, $32.12.

And the President said: "My aim . . . is to establish and maintain *continuous* control."

England understands what that means—no fooling—"maintained control."

That's it. That's the phenomenon we are witnessing just now in this country. Business is uncertain and withholds credit, and while gold goes up, prices decline. Uncertainty in this case is the outcome of lack of knowledge of the facts. The facts are fast coming to the surface. Credit will return.

England and France know that the steady advance of gold will ultimately raise commodity prices. They don't propose to await the awakening of this sleeping financial giant of the occident. They are going in for immediate stabilization before this country wheels in behind its President and sweeps every vestige of control of world's values into the hands of Uncle Sam.

Control of gold is the basis—the rock bottom.

The United States control of gold market is to be established and maintained.

We shall emerge triumphant.

Faith of Our Fathers

WHEN the Pilgrims landed at Plymouth Rock, they faced an unknown world. They were exiled in a new and perilous land, separated from the homeland by a vast ocean over which by some miracle their frail boats had safely brought them.

From the beginning, the faith of these pioneers in a wise Providence that would protect and deliver them from every evil was tried by humanity's direst foes: exposure, famine and attacks by savages.

But that faith never wavered. Through privations, sickness and hostile persecutions they looked into the future, confident that the same Protecting Hand that had guided their course over a great and unknown sea would lead them into the security of a comfortable and happy dwelling place.

And when the first fruits of their efforts appeared, did they put away that faith to which they had clung during the days of tribulation? They did not! They stood fast—and when the harvest had been gathered they joined together in fervent thanksgiving for the blessings they had received.

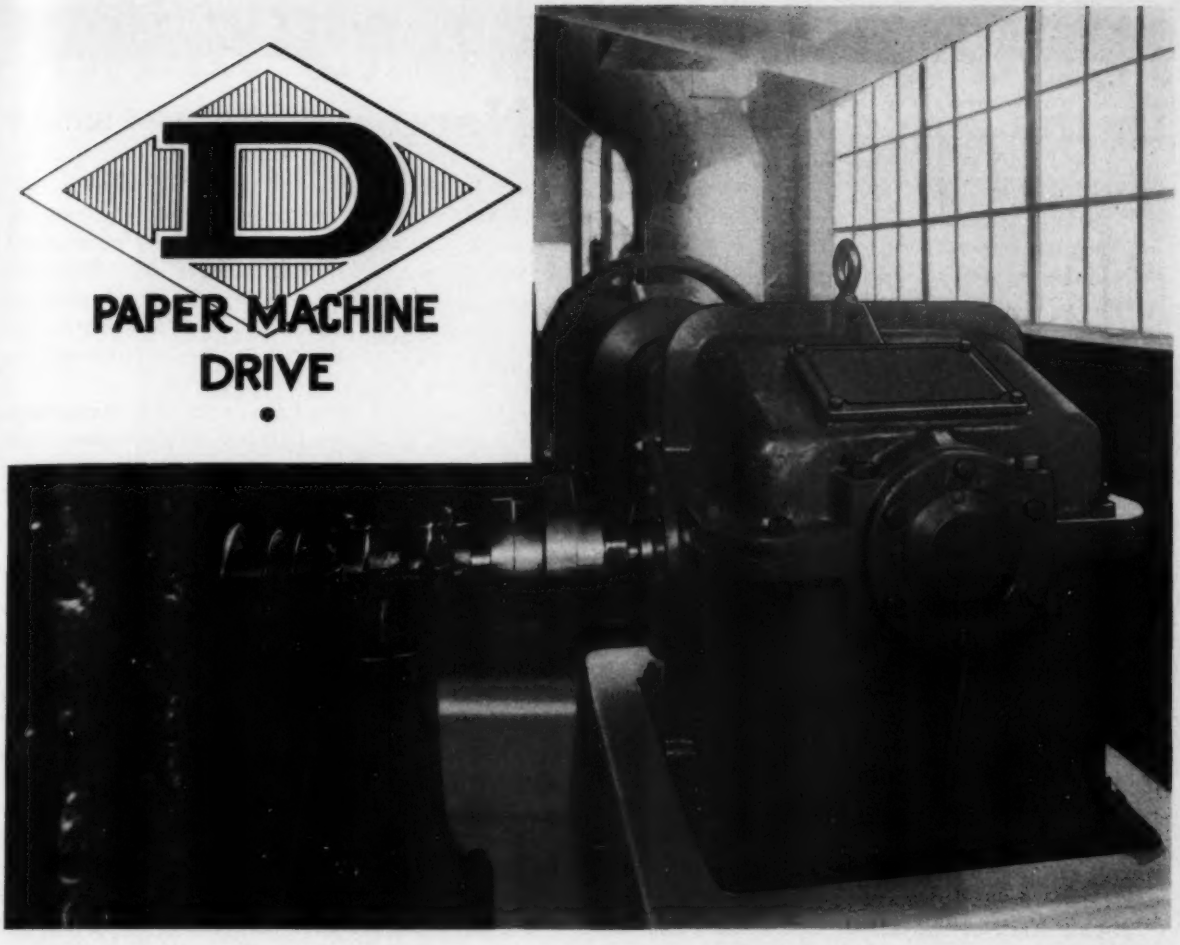
This great nation now stands a monument to the faith, courage and self sacrifice of those forefathers. It has grown and prospered and has become a leader among the nations of the world. And once again we approach the season that marks the anniversary of that first Thanksgiving Day.

For the past four years, this commonwealth has been shaken by economic temblors. There has been famine in business; great numbers of people have been in want; and the structure of the nation has been attacked by insiduous forces which at times have seemed to threaten the peace and prosperity of the future.

Remembering the unswerving faith of our forefathers, shall we who have inherited this the greatest and most beautiful of all countries, founded by them, be afraid for the future? Can we ever doubt that the same guiding hand of the Father of all who protected and fed that brave band in a new and hostile land will still guide and watch over those who trust in his protection? Shall we not know that those to whom is entrusted the leadership of this nation will be inspired and divinely led?

There is yet much to be accomplished, but already there are some signs of harvest. And on November thirtieth, the annual Thanksgiving Day set apart by the President, let everyone think on these things. Let us renew our faith, and rest in the assurance that the principles upon which this beloved nation was founded will ever exist—*they will continue to live in the hearts of its people.*

PAPER MACHINE
DRIVE



Rugged Design and Precision Workmanship Insure Trouble-Free Operation of Dodge Paper Machine Drives

This husky 28-inch Hypoid Drive was recently installed in a Wisconsin mill. It is a double drive for a 10'-0" diameter Yankee Dryer and two press rolls on a 132-inch machine. Dodge Paper Machine Drives embody correct design, specialized engineering and standardized parts. Either hypoid or spiral bevel gears can be furnished.

Power transmission engineering has been the exclusive business of the Dodge Manufacturing Corporation for over half a century. Dodge drives are designed and built with one objective in mind—to transmit maximum power continuously. Write for complete description and specifications of the drive shown.

DODGE MANUFACTURING CORPORATION
MISHAWAKA - INDIANA

Modern Power Transmission Equipment

In the Field of Human Need

By WILLIAM SIBLEY

PRESIDENT ROOSEVELT has made the definite promise to the nation that during the coming winter anyone in need of protection shall be given shelter; anyone who is hungry shall be fed. . . . . Almost in the same breath, the President elsewhere stated that "the worst is yet to come," referring, of course, to economic conditions and industrial recovery. With respect to the latter, many men and women of vision foresee in the coming six months a period more trying than any yet endured during this depression; some going so far as to privately express the opinion that the winter of 1933-1934 may be the most severe in American history.

In publicly declaring relief for all suffering, the President has set a big job for himself, or rather, for his lieutenants, Mrs. Franklin D. Roosevelt and Newton Baker, in whose charge has been placed the social welfare work of the new "1933 Mobilization for Human Needs." This is indeed an inconceivably big job, but a job which will have not only the instantaneous but unflagging support of every right-thinking American. We (and by "we" I mean exactly what that pronoun implies: each and all of us) must see to it that the President's plans for the alleviation of physical distress works—and works to the last baby and the very end of the line.

In this work of assistance, we as the paper and pulp industry, have both an opportunity and a privilege. If the few thousands of plants and mills which collectively comprise our industry will separately see to it that within their dependent ranks no one man or woman need appeal to government agencies for relief—we will have accomplished more perhaps than any other single industry of equal, or even approximate, size.

Many mills today are operating at only a percentage of their ultimate capacity. There are small indications of an increased demand sufficient to put the industry on a one-hundred per cent productive basis this winter. But even if we could step up our production to 100 per cent next week, and thereby give employment to many thousands who are now idle, still the job of winter relief would be present and pressing. This depression will soon have passed its fourth birthday, and the accumulated needs and suffering of that period cannot immediately be dispelled by the resumption of pay checks. Certainly not with winter coming on, some sections already being in the grip of very cold weather. Just a few facts:

Since 1929, all hospital care has decreased 15 per cent, but during that time the demands of free patients have increased 79 per cent. Today the hospitals and clinics of the country are daily meeting the cost of 400,000 added day's service to people who can pay nothing for the service received. This load is rapidly exhausting the endowment larders of those institutions and this means the approach of the time when a drastic curtailment in free service will be forced—in the face of increasing need.

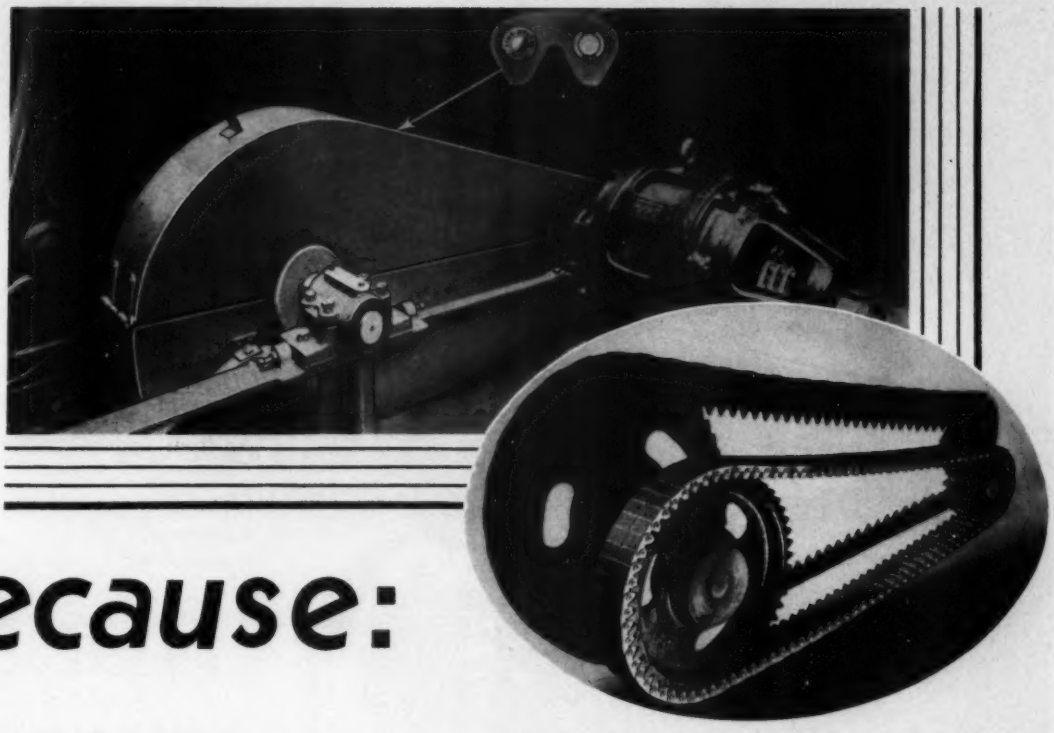
In the last four years (in thirty-five states) the total number of visits to free clinics has more than tripled. In some states, the increase has been as much as ten times. The Federal Children's Bureau estimates that one-fifth of the children of the nation are today suffering from undernourishment.

The relief job confronting the Federal, State and Municipal governments is huge; clearly, so great that these public agencies cannot do it all. Hence the opportunity for every mill management in our industry. Every plant has its dependent personnel (the families of those who are now, or were, on our payrolls) and if each such mill or each individual will see to it that no such dependent need go to the government agencies, this industry's contribution to the general public welfare will be of signal importance. We will have done much to help this administration in its public service work—and doubtless have gained a degree of appreciation and gratitude within our local communities far more than enough to compensate us, dollar for dollar, for the time and money so expended.

As I have said: according to the Federal Children's Bureau one-fifth of all the children in the United States are today suffering from undernourishment. These children will be the men and women of America twenty years hence. What they will think of the society into which they have been reared depends largely upon what we do to them today—this winter. While it is true that strong characters are born of adversity and struggle, the kind of adversity that builds character is hard work and trying tasks on a full stomach, not idleness and sickness on an empty stomach. The one admits of hope; the other develops despair. Children who are surrounded by artificial handicaps to which their neighbors and employers are indifferent acquire unsocial viewpoints and shattered faiths.

The paper industry can point with justifiable pride to its record for safety and industrial accident elimination. Will it emerge from the coming months with the same pride of accomplishment in the field of human need?

Silent Chain SERVES BEST



Link-Belt Silent Chain Drive operating super-calender machines

because:

1 Link-Belt Silent Chain Drives work smoothly and positively, the pull being distributed among all the teeth engaged.

The loads of spur gears fall on one tooth at a time; while of course belts have no such thing as a positive toothed grip.

2 Link-Belt Silent Chain is easily installed, as the ends can be coupled to suit your centers.

You have to take down line shafting or remove shafts from their bearings in many cases in order to install endless belts or ropes.

3 With Link-Belt Silent Chain the driving force is both positive and elastic, meeting the changing requirements of power with a steady, uniform action.

The application of sudden loads to belt, rope or gear drives, due to the changing feeds and speeds of machine tools, for example, often results in chatter, roughness, and "seconds" in the product.

4 Reductions up to 15 to 1 are entirely practical and satisfactory with Silent Chain Drives.

Belt drives cannot be used efficiently on large reductions because of the reduced surface of the driving arc.

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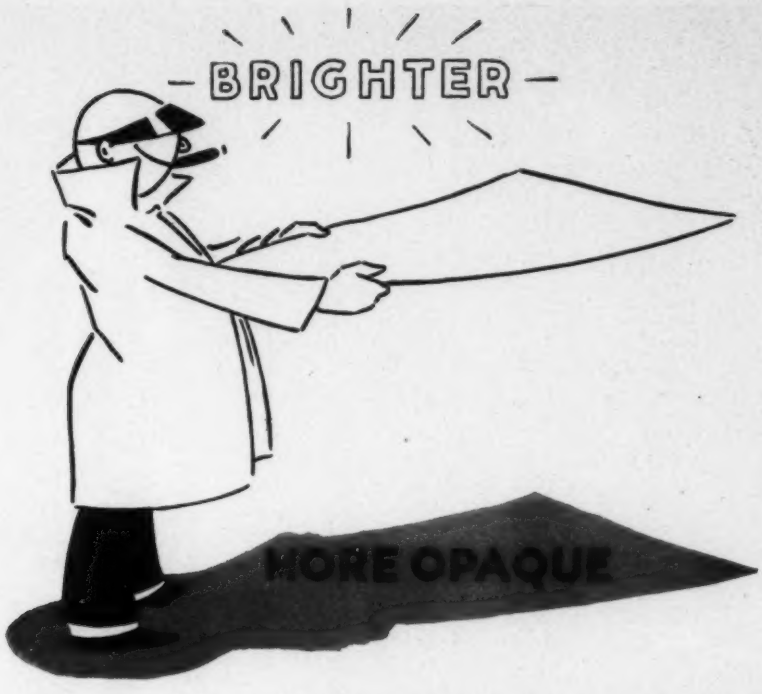

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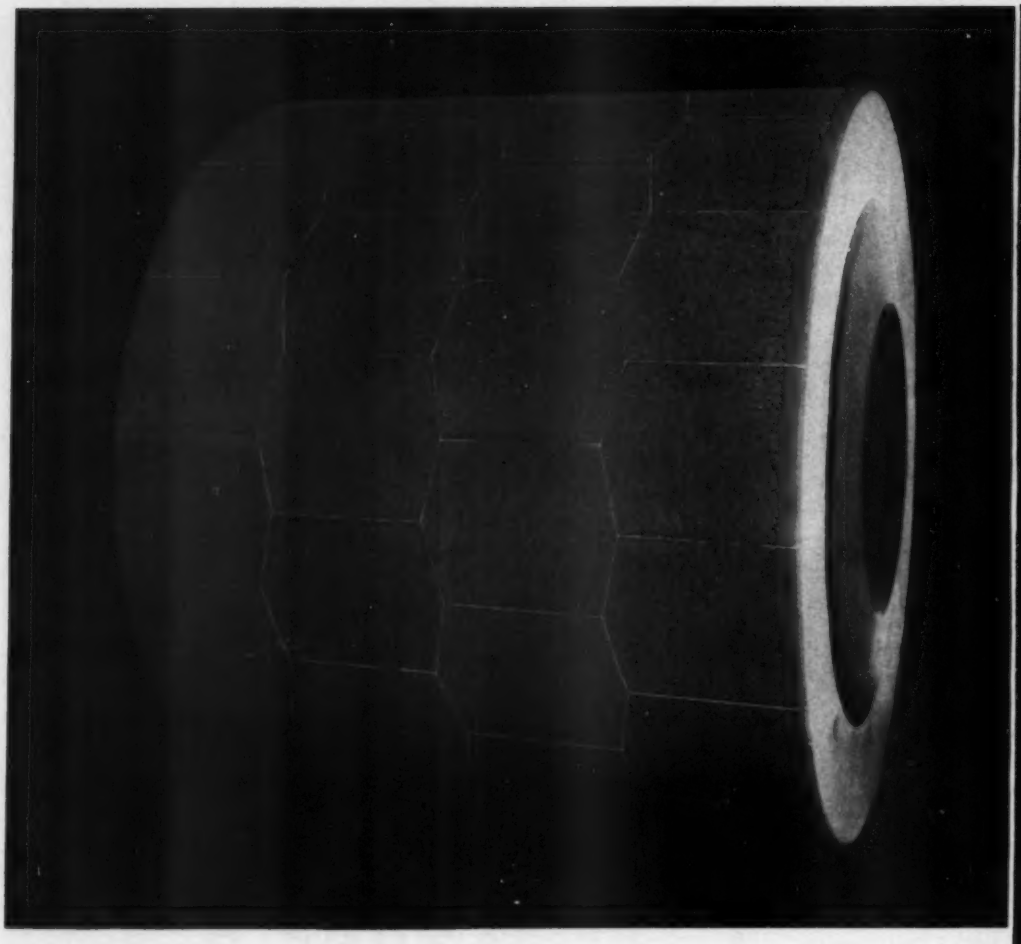

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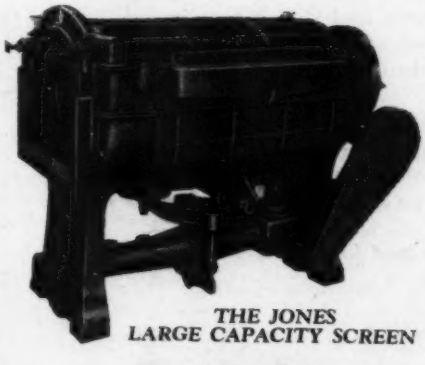

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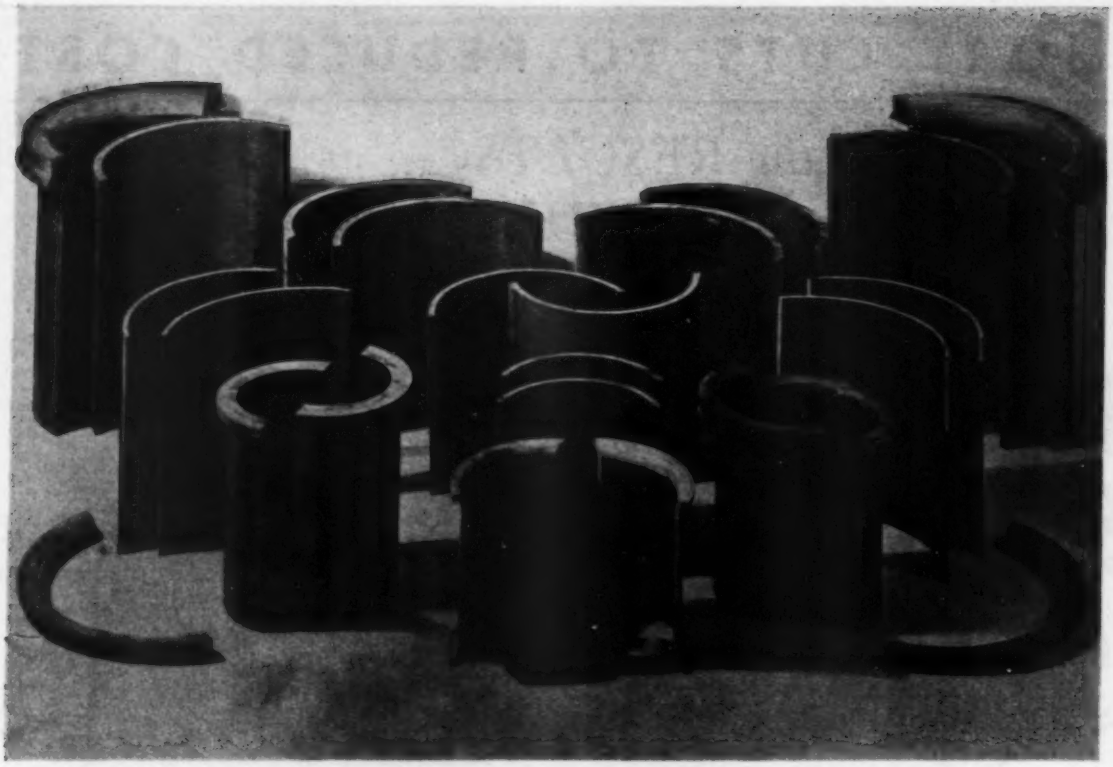

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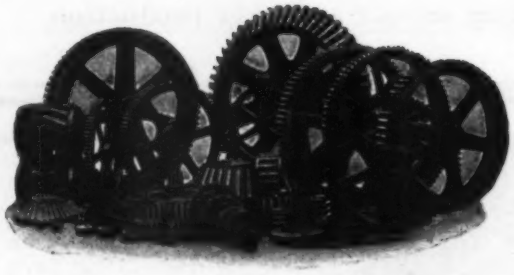

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THE PAPER INDUSTRY
A MONTHLY EDUCATIONAL JOURNAL

The Characteristics and Power Requirements of Paper Machines

By H. W. ROGERS
Industrial Engineering Department
General Electric Company

PREVIOUS to the last decade, it might have been said that a paper machine was a *paper machine.* It was very much the same as when originally developed and invariably consisted of the same sections and operated in the same manner wherever found. To be sure, it was generally equipped with minor gadgets which were supposed to improve the operation, but the skeleton seldom varied to any great extent. Nor was there a great deal of information available concerning the operation or characteristics of the machine, either among the paper manufacturers or the machine manufacturers, because the type of drive used was of a mechanical nature which does not lend itself readily to any extensive analysis of characteristics or operating conditions.

In 1919, the demand for increased production created two schools of thought, one favoring wide slow speed machines, and the other favoring narrow high speed machines. Needless to say, the latter group predominated, temporarily at least and the sectional electric drive was developed to meet operating conditions which were admittedly beyond the possibilities of the existing mechanical drive.

Subsequently, machine development advanced to a point where even the most venturesome and progressive individuals could be satisfied with wide high speed machines.

The development of the sectional electric drive made it possible to thoroughly analyze a paper machine in its various elements, both as to power requirements and actual operating conditions. It resulted in a definite knowledge of "draw" conditions for various grades of paper and the influence these grades of paper had on the power requirements.

The sectional electric drive was naturally much more sensitive than any form of mechanical drive and clearly indicated what was taking place. It permitted the operator to study the laws of cause and effect, to trace difficulties to their real source, and undoubtedly has had a marked bearing on paper machine developments during the past decade. The gradual improvement of the sectional electric drive in flexibility, control and speed regulation to a point beyond the possibilities of any mechanical system were due in part to the electrical manufacturers, but perhaps more to a desire by the paper manufacturer to improve his product, realizing full possibilities of the electric drive.

Since 1920, there has been an enormous accumulation of segregated power data on all types and sizes of machines running at all speeds on practically every kind of paper, and these data have been very carefully analyzed and plotted in curve form for the benefit of those who are interested in the design of electric drives and the power requirements of paper machines.

It has generally been considered that the paper machine has a constant torque requirement; that is, the power is directly proportional to the speed. This is true of all sections except the couch, calender and reel sections, and it is also true that the power varies directly with the width of the machine on all sections.

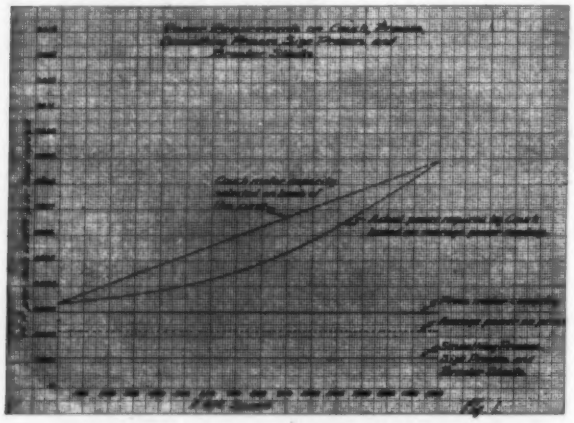
Wet End Power Requirements

On the couch or wire section the actual friction load of a properly aligned unit is very low, approximately 0.00014 hp. per inch width per foot speed, and the use of a suction couch roll does not require any increase in power, if the suction box is properly adjusted. The suction on this roll should be sealed with a water film which is a good lubricant, but if the box is screwed up too high, this water film is destroyed, resulting in a high friction load, increased power consumption and possible trouble from other sources.

The greater portion of the power on the couch results from the suction boxes on the wire, which are a 100

per cent friction drag. The amount of suction held on these boxes varies with the kind of paper being made, the freeness of the stock and the speed. Generally speaking, the power constant for the couch increases with the speed; the maximum occurring on high speed machines. Notable exceptions to this are found on machines making glassine and bond papers which have high power constants; i.e., 0.00075 hp. per inch width per foot speed, regardless of the speed at which paper is being made, because they are made from "slow stock" which does not give up water freely and consequently require high vacuums.

These peculiar characteristics of the couch are clearly shown in Figure 1, the curved line being the average of a large number of power readings taken



over a period of years. The straight line curve, on which motor capacities are based, is somewhat higher than the average curve in order to take care of requirements which fall above the averages.

In speaking of the suction on the boxes, one usually refers to the suction at the header in inches of mercury, but the effective vacuum at the box is an entirely different value. Practically no information is available on this subject, and, while the author has had some occasion to investigate it, the investigation has not been complete enough or extensive enough to draw any conclusions or formulate any definite rules concerning the effect of vacuum on power. The work already done may, however, point the way to further investigation and the ultimate use of more effective suction boxes and savings in power.

In Figure 2, curve *A* shows the vacuum at the boxes with 4 inches of vacuum at the header. Number 1 box is the wettest box and removes more water than any of the other boxes, but it has only ½ inch vacuum at the box, showing a loss of vacuum of 3½ inches between the header and the box. Number 6 box is taking out much less water and only shows a ½-inch loss of vacuum. Curve *B* applies to 8 inches vacuum at the header with only three boxes in operation. Incidentally, both conditions were satisfactory for making the same weight of paper at the same speed.

In Figure 3 the power constant for the couch has been plotted against vacuum on the suction box header, for six boxes on glassine paper and three boxes on kraft paper, but conditions did not permit of obtaining similar data on four and five boxes or of experimenting with different vacuums with a varying number of boxes on the same grade of paper at the same machine speed. It would appear, however, that some advantage might be gained from a re-design of the suction boxes and a tapering in the size of the pipes between the box and the header to avoid loss in vacuum and possibly secure equally good results with lower vacuum.

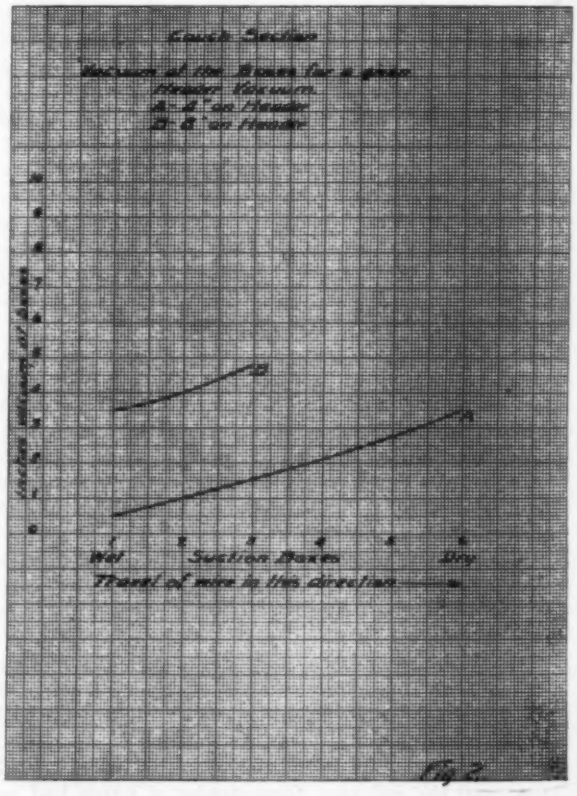
The power requirements of presses vary somewhat with the pressure of the top roll and the use of felt suction boxes, but average readings indicate about 0.000225 hp. per inch width per foot speed. In selecting press motors, a power constant of 0.0003 will cover all cases. The use of suction rolls for the first press and sometimes for the second press does not affect the power required to drive the press, but it does affect the power of the suction pumps.

Smoothing presses, breaker stacks and size presses are small power users and require but 0.00012 hp. per inch width per foot speed as shown in Figure 1.

Power Characteristics of Dry End

The dryers are, of course, the only heavy inertia section on the paper machine and are subject to variations in power from different causes, the most common one being water.

The presence of water in the dryers even in small quantities causes enormous increases in power demand, and while it is readily discernible by the cur-

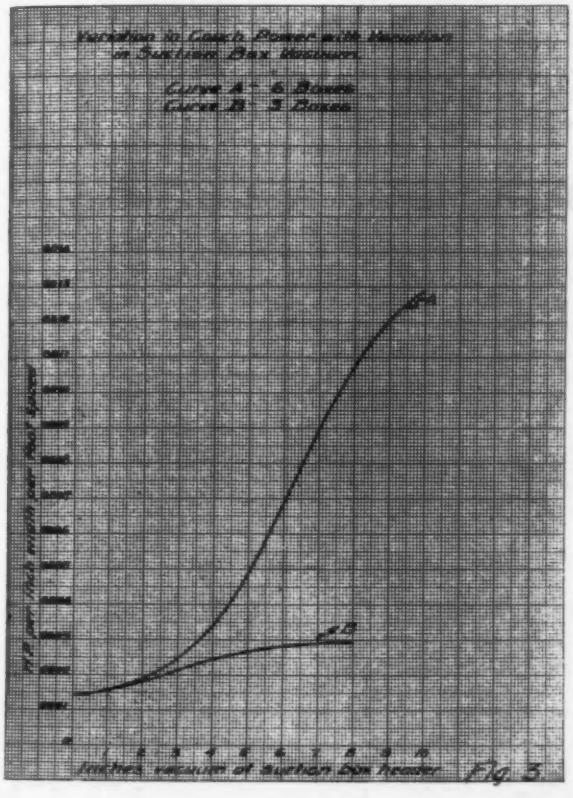


rent reading on the motor, it has an equally detrimental effect on the temperature of the dryer which is more difficult to ascertain. Of course, the cause of this difficulty is in a faulty evacuator system.

Bearing trouble may cause an increase in power required, but this usually occurs at extremely low speeds and is due primarily to the destruction of the oil film. The use of pressure lubrication or roller bearings overcomes this difficulty.

Power readings indicate that a normal dryer requires 0.000018 hp. per inch width per foot speed per individual dryer and while the use of roller bearings has reduced this materially, in some cases there is not sufficient evidence available to justify taking advantage of it. The starting torque on dryers with the conventional sleeve bearing is very close to four and one-half times the running torque, while roller bearings will reduce the starting torque to the running torque in most cases.

The calender section does not have a constant torque requirement but differs from the couch in that its



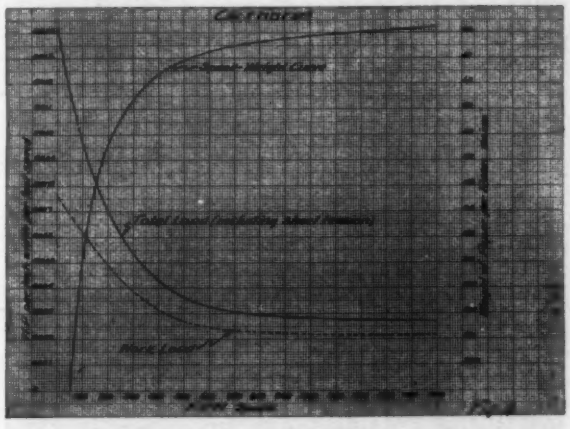
maximum requirement is at low speeds on heavy weight papers and it decreases as the speed increases. The load is made up of two factors; i. e., the actual work done on the sheet, and the tension in the sheet, the latter causing a transfer of load from the dryer motor to the calender motor.

The number of rolls used in a stack of calenders and the weights used is usually determined by the weight of paper being manufactured; consequently, the power constant is determined from the maximum weight of paper to be manufactured rather than from the number of rolls or the speed in f. p. m.

Figure 4 shows the variation in power requirements of calenders for different weights of paper and for different speeds, it being assumed in the calculations that the paper machine is approximately a constant tonnage machine, so limited by its drying capacity.

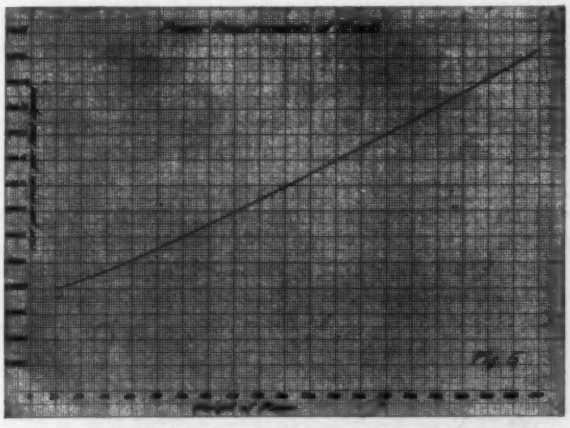
In calculating the total load of a paper machine, it is advisable to consider the total dryer load as calculated and use the working load constant for the calender because the sheet tension merely unloads the dryer motor, but when figuring the calender motor capacity, the larger power constant should be used.

The reel is somewhat akin to the calender in that its power requirement is determined from the weight



of paper as shown in Figure 5, and this same curve may also be used for winders, although the winder is not strictly a part of the paper machine.

On sectional electric drive where each unit of the paper machine is motorized, it is clear that the motors must be selected to take care of the maximum load conditions of each individual unit although they may not carry this load at all speeds or on all grades of paper. For instance, the couch load conditions are heaviest at maximum speeds, except on glassine and bond papers with which heaviest load may occur at any speed, and the load conditions on the calenders

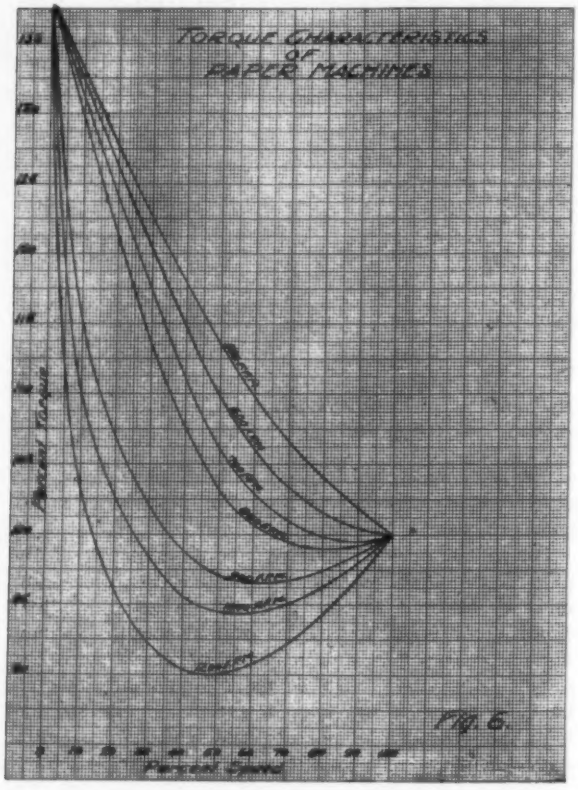


and reel are heaviest at low speeds, while on the remaining sections it is practically independent of speed and weight of paper.

Knowing the conditions of operation on a paper machine such as the width, maximum and minimum speed in feet per minute, number of sections, maximum and minimum weight and kind of paper, etc., it is possible with these data to approximate the power requirements at various speeds within very close limits.

Heretofore, it has been generally assumed that a paper machine was a constant torque machine requiring power in direct proportion to the speed, but this is not strictly true as is evidenced by the curves in Figure 6 which have been plotted from these data.

The speeds in f. p. m. are the maximum at which the machine is to operate and on high speed machines there is a reduction in torque followed by an increase



as the speed is reduced. Normally, we do not find wide range high speed machines so that a portion of their curves would seldom exist in practice.

The lower speed machines, however, do show an increasing torque at reduced speeds when making heavier papers.

Paper Machine Power Constants

For general use, these power curves are not followed exactly, but certain values are used for different grades of paper; for instance, there are generally accepted constants for the couch, calender and reel such as the following, and they will be found to agree very closely with the curves.

Couch

.0005 Tissue, toweling and light wrapping.
.00075 News, kraft and book up to 1200 f. p. m.
.0010 Machines operating from 1200 to 1500 f. p. m.
.00075 Bond and glassine.

Calenders

.00050 up to 70 lb. paper.
.00075 from 70 lb. to 120 lb. paper.
.00100 from 100 lb. to 220 lb. paper.

Reel

.00012 all grades except kraft.
.00200 for kraft.

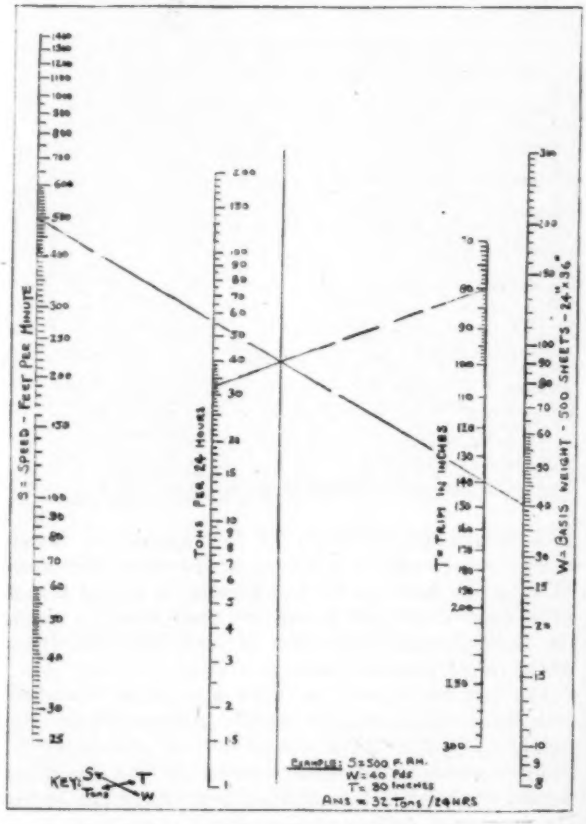
Normal operating conditions on a paper machine are difficult to define because no two manufacturers operate their machines in the same manner. There are variations in vacuum on both the boxes and the suction rolls; there are variations in pressure on both the press rolls and the calenders; there are wide variations in sheet tension between the dryers and the calenders; there are misalignments in some machine sections and occasionally hot bearings which are nursed along until the machine can be shut down for a daily or weekly clean up. In a sense, these conditions may be considered as normal, although the lack of uniformity clearly indicates a lack of definite knowledge along certain lines and points the way to justifiable investigation.

So long as present conditions exist, motors for paper machine drives must be selected with a view to meeting all possible conditions of operations and being able to carry on until abnormal conditions can be corrected or repairs made conveniently. Continuity of service is important and conservative motor capacities are desirable especially on the couch and calender sections.

❖ ❖ ❖

Paper Machine Production Chart

By E. Cowan


S = SPEED - FEET PER MINUTE
TONS PER 24 HOURS
T = TRIM IN INCHES
W = BASIS WEIGHT - 500 SHEETS - 24" x 36"
KEY:
EXAMPLE: S = 500 F. P.M.
W = 40 Pds
T = 80 INCHES
ANS = 32 TONS / 24 HRS

The above self-explanatory chart will prove a time-saver in computing the production in tons per twenty-four hours of paper machines of widely varying widths over a wide range of speeds and ream weights—*Editor.*

Some Essentials of

Power Transmission Layouts

By M. A. BUETTELL, Engineer
Dodge Manufacturing Corporation

TO the papermaker, his art is unique in many respects as compared with other industries. So also does the miller see his job of producing flour or the steel mill man the rolling of bars and billets.

But making paper, producing flour and rolling steel have certain essential similarities. There are no doubt other industries which might be included as having strikingly fundamental likenesses. But for the sake of simplicity, consider only the three industries mentioned.

Making paper, milling flour and rolling steel have the following fundamental likenesses:

1—The operations are most economically carried on when continuous throughout a 24-hour day.

2—The investment in machinery to perform the manufacturing operations is great compared with the cost of labor to operate these machines.

3—The flow of production is continuous from start to finish.

One who is familiar with the requirements of each of these three industries would see these basic similarities. A papermaker would see the likeness of the modern rolling mill to his paper machine, as the steel sheets come out of the rolls and pass through the rotary shear much like his sheet of paper comes through the calender and is cut to length. The beater engineer of a paper mill would likewise see a similarity in flour milling where the raw material, wheat, is cleaned, crushed, classified and ground to a finely divided state, to his own process of cleaning, shredding and finely dividing the fibers for hydration.

The power transmission layout of a paper mill is made to conform to the requirements of that industry. But the fundamental design may have been borrowed from the basic transmission layout of a steel mill, flour mill or some other industry. The back side of a modern electric-driven steel rolling mill looks quite similar to a sectional electric paper machine drive. So also does the roller mill lineshaft drive in a flour mill resemble many beater room lineshaft drives.

Importance of Power Transmission

Power transmission, then, is a field distinct from the equipment or machinery it operates, but adapted from the experience of all industry to suit the specialized needs of any one type.

Basically, there are three distinct steps in the power layout of any plant: (a) The generation of power; (b) The transmission of power; (c) The utilization of power.

In considering these three phases in any particular plant, the last one usually receives first consideration because it is determined directly by the actual manufacturing process. In the construction of new plants, the question of power generation has received in some cases almost as much consideration, since mills were often built adjacent to a source of water power supply.

The transmission of power from the source to the point of final utilization, because it must be accommodated to the other two phases of the power layout, often presents the most puzzling problem.

Power generation is a field worthy of the most careful consideration by power plant experts for a determination of the best solution to any given situation. The responsibility for the useful work which this generated power is to perform on the manufactured product is left to the builder of specialized production machinery in any particular industry who constructs his equipment to most efficiently utilize the power delivered to it. The question of how to transmit the efficiently generated power to the expertly built machine is as separate and distinct as the other two problems and worth the same careful consideration.

Most industrial plants would not think of placing in the hands of its engineering department final authority for the selection of the kind of power to be generated or the design and construction of the power plant. The opinion of power generation experts would be sought for the best counsel on this subject. Neither would a manufacturing plant give its engineering department full authority to design and construct the machinery to finally utilize the generated power in producing the product. Machinery builders in the particular line of industry can offer from their experience better ways of performing the manufacturing operations.

Yet an industrial plant will sometimes turn over in its entirety the problem of the correct transmission of power to its engineering department, its master mechanic or millwright, without counsel from experts in the field of power transmission.

Scope in Paper Mills

Power transmission in paper mills demands as much care as power generation or power consumption. The incorrect transmission of power is subject to just as flagrant wastes as the incorrect generation or utilization of that power. A simple case will illustrate.

Assume an average width fourdrinier paper machine on which the machine builder gives the power required to drive each section at a given speed, as follows:

Suction couch	22 hp.
First press	18 "
Second press	15 "
Third press	15 "
First dryer section	20 "
Second dryer section	18 "
First machine calender	24 "
Second machine calender	28 "
Total	160 hp.

Assume a conventional variable speed lineshaft driven from an electric motor and belted through taper

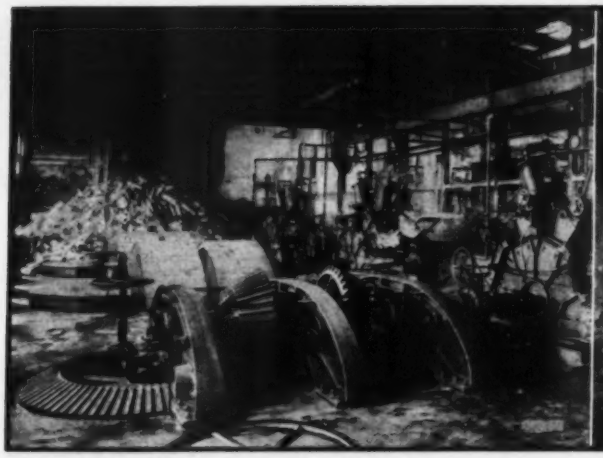


Fig. 1—Geared drive from vertical shaft water wheels to pulp grinders

Fig. 2—Main beater lineshaft drive from steam engine through 72-in. belt

cone pulleys to open mortise tooth gear sectional drives. The power input to the main motor may easily read 210 hp. The difference between this and the sum of the powers required to drive each section is 50 hp. or over 31 per cent of the power actually used in the machine. This amount of power is being used in transmitting the 210 hp. of generated power into 160 hp. of utilized power at the paper machine. At $45.00 per hp. year this amounts to $2,250.00 per year as the cost of power lost in transmission.

There is just as much chance for losses to creep into the power transmission system as into either the generation or the utilization.

A power transmission system may be likened to a steam line. At one end is an efficient boiler producing low cost steam. At the other end is a high grade steam engine. Suppose the two are connected by a long steam line, full of sharp turns and twists, of very small diameter pipe and without insulation on the pipe. The efficient boiler and the most advanced type of engine could not eliminate the loss in the steam line transmitting the power between them if it was poorly designed.

The power in a transmission system may be compared to the water from a high pressure, high efficiency centrifugal pump. If the pump is connected to a long, poorly designed pipe of small diameter and with many sharp bends, the losses in transmission may almost entirely use up the power supplied by the pump.

Many power transmission systems are exactly similar. Expert design and experienced workmanship lay out the most modern power generation system that can be produced. Skilled machinery builders provide the finest equipment for utilizing this power to produce paper. But the transmission system carrying the power from generator to machine is like the long exposed steam line or the tortuous undersized water main. Neither can carry its load economically.

The subject of correct power transmission in paper mills has too many ramifications for detailed analysis in the space of this article. Nor can any short generalization offer a cure-all for power transmission ills in the industry.

Some pertinent points are worth bearing in mind as basically fundamental in laying out power transmission designs. Paper mills seek for continuous operation. The high investment in machinery makes shut-

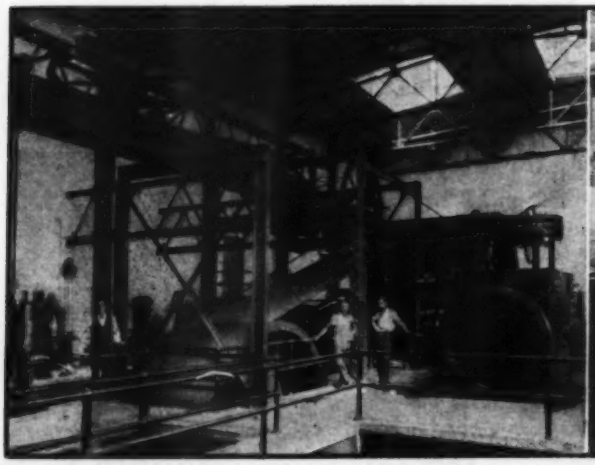


Fig. 3—Two-way beater room lineshafts with rope drive from 3000 hp. steam engine

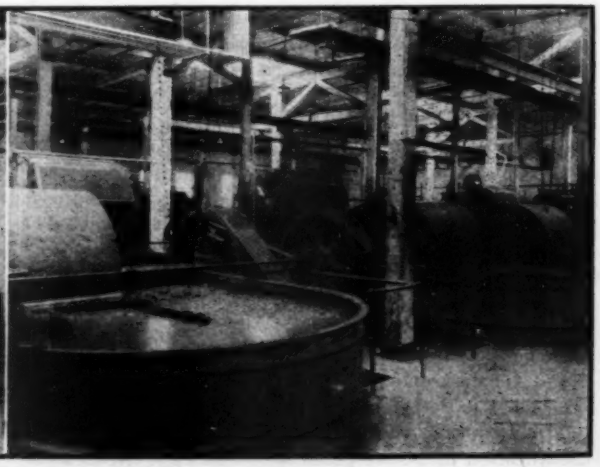


Fig. 4—American system rope drive to group of thirty-two beaters

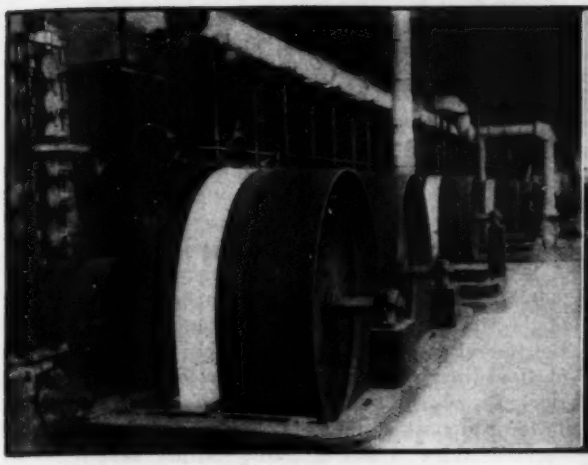


Fig. 5—Direct connected taper cone pulley drives to sections of machine

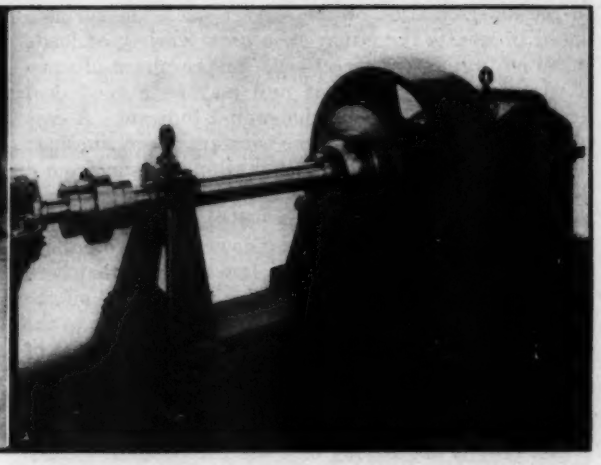


Fig. 6—Hypoid gear unit for driving sections of machine from main lineshaft

downs expensive. Machine hands can be sent home, but the interest, depreciation, insurance, taxes and obsolescence charges go on whether the machine runs or not. When one manufacturing unit stops, the continuous flow of material is broken and the entire system is paralyzed.

The above factors evolve a simple code to which power transmission must measure up for paper mill use:

1—It must be as dependable as good design, materials and workmanship can make it.

2—It must be simple, fool-proof and easy to repair in case of unavoidable breakdowns.

3—The design and quality of materials used must be consistent with low operating and maintenance expense based on 24-hour service.

Power transmission in paper mills resolves itself almost entirely into the correct transmission and application of rotary motion. In earlier construction, rotary speeds were fairly low as typified by the reaction water turbine and the reciprocation steam engine. The former applied power directly into rotary motion which was immediately transmitted through shafts to pulleys, sheaves or gears. The reciprocating steam engine transmitted power through a connecting rod to a crankshaft and flywheel and thence to a rotating shaft.

The first element in mechanical power transmission is the round shaft. In spite of the common use of commercial shafting the basis for its correct application is often pure guesswork. This leads either to extravagant waste or expensive breakdowns and replacements.

The accepted method of figuring shafting is on the basis of the allowable shearing stress in the fibers of the steel. The amount of this shear is determined by the loads imposed on the shaft through twisting or torsion, bending or flexure, a combination of both, or tension or compression due to vertical shafts or bevel gear loads.

Knowing the materials of the shaft, some standard allowable working values of torsion and bending, or a combination of them, have been worked out for various commercial shaft sizes. With these values it is then up to the designer to select a shaft of sufficient size to take care of the loads imposed upon it.

Paper mill lineshafts often present difficult problems

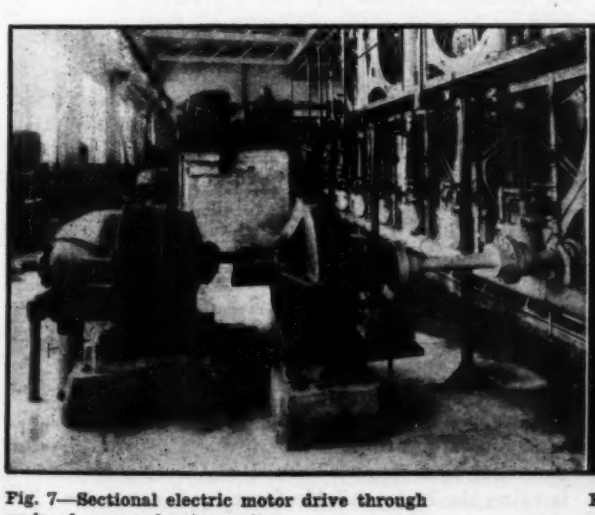


Fig. 7—Sectional electric motor drive through enclosed gear reduction unit

Fig. 8—Combined enclosed gear, taper cone pulley and silent chain drive

in the determination of the correct size. On variable speed lineshafts there may be a great variety of loads taken off in different directions. The resultant of some of these forces due to belt pull may be a good deal greater than casual inspection would indicate. A case of this kind was found on the constant speed lineshaft of a high grade writing paper machine driven from a 100 hp. motor. The motor was belted to the lineshaft and immediately adjacent was belted a 50 hp. vacuum pump. The bearings on either side of these two pulleys gave almost continual trouble. It was found that both the main drive and the pump drive were belted off the same side of the lineshaft. By moving the pump to the opposite side of the line from the main motor, part of the motor belt load was equalized by the pump belt load and the hot lineshaft bearings immediately ceased to give further trouble.

Not only is the loading of a shaft important, but the character and application of the load must be considered. If the loads are suddenly applied or subject to violent fluctuations, the shaft sizes must be more liberal so that the peak loads will not exceed the elastic limit of the shaft. In throwing a dryer section of a machine onto the line suddenly, the inertia of the dryer rolls may cause a starting load four or five times the amount of the normal running load. If a jam occurs in a calender stack, the load on the bottom roll may build up enormously before the operator can throw out the sectional drive on that part of the machine.

Consider a paper machine lineshaft driven at one end by a steam engine. The lineshaft is 200 feet long with power taken off through belts approximately every 20 feet. This shaft is equivalent to the power line from an electric generator to a group of motors. The electric power line would be designed heavy enough to carry the motor loads.

Common Mechanical Transmission Abuses

In a rule-of-thumb method of calculating the shaft size, it may be designed too small. Excessive fiber stress will be set up due to torsion or bending strains and the shaft will eventually fail through fatigue. In mechanical transmission the elements will ordinarily stand more abuse without detection than in an electrical system. If some rule-of-thumb method were used in running an electrical power line and the line was made too small, the results would immediately appear. There would be a noticeable voltage drop from generator to motor and actual heating of the copper wires might occur.

A second flagrant oversight in the layout of mechanical transmission is lack of foresight. Before running an electric power line, careful consideration is usually given to future loads that might be placed on this line and oversize copper used if necessary. When additional motors are later added the line is large enough to handle the loads. On mechanical transmission the original shaft size may be a guess and additional drives are taken from it from time to time without thought for the additional strains imposed.

Abuses have as often occurred in the use of the second mechanical power element as typified by the pulley. Sheaves, gears or sprockets may be considered simply as modifications of the pulley. Ordinarily, pulleys are specified only as to diameter, face width and bore. It would be as sensible to order a centrifugal pump by giving the manufacturer only the size of the pipe line to which it is to be connected. Many paper mills buy pulleys simply at so much per pound weight. This may be an economical way to purchase press lever weights where the machine tender can put the weight where he wants it. But in pulleys it is not only uneconomical but dangerous to buy a pulley as simply 900 lb. of iron, without specifying the speed, horsepower, belt width and thickness and effective tension. A 900-lb. pulley may run smoothly at 250 r.p.m. A 900-lb. pulley at 500 r.p.m. may shake the foundations of the mill. It is entirely a question of where and how the weight is distributed. Examine the rim fracture of an ordinary split cast iron taper cone pulley. Is the thickness of iron uniform from one edge to the other? Is the rim as thick on one side of the pulley as on the opposite side? Cases of pulley failure have occurred in which a check showed the thickness of iron to vary from $\frac{1}{8}$ in. on one edge to $\frac{5}{8}$ in. at the other edge.

The proper design of a power line which combines both shafting and pulley calculations is quite as important as the proper design of a high tension electric transmission line. Fundamental errors in either may lead to disastrous results.

An illustration of this occurred recently in a large paper mill on a 195-ft. long variable speed lineshaft located in the basement below the machine floor. Originally, this power line was designed for a maximum of 350 r.p.m. By degrees the paper speed had been increased until the lineshaft was turning up some 450 r.p.m. Pulley rims which originally traveled between 4000 and 5000 feet per minute, now exceeded 6000 feet. The strain of out-of-balance pulleys finally caused fatigue in the lineshaft at the end of the line away from the driving motor. In an instant the whip of that broken shaft end had traveled down the full length of the line like a hurricane, tearing up bearings and strewing wreckage the length of the basement.

Another failure of a main power line occurred recently in a paper mill through a different cause. The beater room in this mill was originally driven by a Corliss engine connected to the beater lineshaft with an American system rope drive designed for 500 hp. load. Changes in the character of stock had caused the beater rolls to be run closer to the bed plate. Increased production caused an additional beater to be added to the lineshaft. One day, almost without warning, the shaft adjacent to the 10-ton rope sheave failed through fatigue. To enable the mill to continue operation while a new shaft was being secured, the beaters were temporarily belted to individual motors. While thus connected readings were taken on each of the motors and a total overall power load of some 750 hp. was discovered. This mill had been replacing ropes on the severely overloaded drive quite frequently but had failed to have a power survey made to find out where the cause was.

The scope of the field of power transmission applications in paper mills is so broad that it is practically impossible for any one mill to have a definite assurance that with its own limited engineering facilities it is using the best available form for its own use. The shift in manufactured product and causes beyond its

control may often leave a mill seriously handicapped in keeping its power transmission layout best suited to its needs.

Typical Pulp and Paper Mill Drives

Groundwood mills commonly used horizontal shaft direct connected, or vertical shaft geared reaction type water wheel driven grinders (Fig. 1). Denuding of the forested slopes of the watershed supplying the river from which power was secured may have caused wide fluctuations in available head with very low water supply during the summer. To avoid shutdown of some of its grinders during periods of low water, mills have been forced to provide standby units in the form of electric motors. The inshafts to the grinders and method of connection have required revising to allow shifting from hydraulic to electric power or vice versa, at will.

Some mills have had to abandon the direct coupled hydraulic drives to parts of the plant and re-couple to generators. This meant changing to motors and some form of reduction unit to couple the higher speed motors to the low speed machines. Some mills with hydraulically driven lineshaft drives have met the deficiency of seasonal low water by adding electric or steam-driven units pumping power into the main line when required and free to be coupled or uncoupled at will. One large mill has a long, main power lineshaft with three geared hydraulic turbines on one end and two quill clutch drives connected at other points, one from a Corliss engine and one from an electric motor, either or both of which can feed additional power into the main line.

Beater room drives are of as wide a variety of types as almost any other transmission unit in a paper mill. One of the most common is the main lineshaft drive under the beater room floor. Power is supplied to the main line through either flat belt or rope drive. Fig. 2 is a beater line drive from a Corliss engine through a 72-in. leather belt. The main shaft at the driven pulley is 16 inches in diameter. Fig. 3 is a two-way beater lineshaft drive from a 3000-hp. Corliss engine. Both the power to the two main lineshafts and from these shafts to the 32 beaters (Fig. 4) are carried by American System rope drives. Some mills have changed the nature of their product so that the main beater lineshaft drive does not provide sufficient flexibility. Here changes to individual motor drives, using either single or double ended motors, is used. Transmission from the high speed motor requires considerable speed reduction calling for either long open leather belts or short center V-belts, silent chains, pivoted motor base or belt governor types.

Jordan drives have followed the changes noted in the beater drive layouts where more flexibility is required. Direct coupled motors or some of the accepted short center drives are used. V-belt drives from a motor sheave to a flat face pulley on the Jordan plug shaft have been used successfully to allow adjustment of the plug while the drive is running.

Paper machine drives are in about a class with beater drives as regards variety of types. On the variable speed lineshaft type, the prime mover is usually a direct-current electric motor, reciprocating steam engine, steam turbine or hydraulic variable speed unit driven by a constant speed motor. The transmission system to the inshafts on the paper machine vary widely. Some mills use the English system drop-off rope drive in the basement. The vertical drives are through belts and taper cone pulleys on the extended sectional drive shafts or through some form of gear reduction unit (Fig. 5). Some mills substitute flat belt drives for the English system rope drive in the basement.

The most common form of transmission from the prime mover to the sections of the machine is a main lineshaft located in the basement or above the machine floor and carrying taper cone pulleys driving through flat leather or rubber belts to corresponding taper cone pulleys on the sectional drives. The sectional drives are of the open cast tooth or cut-tooth iron bevel gear type, the bevel wood mortise tooth design, or the enclosed worm gear, spiral bevel or hypoid drives (Fig. 6). A clutch or cut-off coupling allows each section to be started or stopped independently.

Transmission of power from the main driving unit to the lineshaft is through belt rope drive silent chain, Multiple V-belt or direct through flexible couplings.

The constant speed lineshaft of the paper machine is driven from the main unit through one of the above types of transmission.

Where one prime mover may drive two constant speed lines, clutches are introduced into the transmission layout to allow independent operation of either line.

On some paper machines instead of a single source of power for the variable speed lineshaft, separate electric motors are used to drive each section (Fig. 7). Power is transmitted to the inshaft of the section directly through flexible couplings where slow speed driving motors are used or through some form of gear reduction unit where higher speed motors are used.

Modifications of some of the above standard types occur on some of the more specialized paper machine drives. Figure 8 shows a combination of main line to enclosed sectional drive, to belted taper cones, to silent chain on a Yankee dryer drive.

There are other parts of the paper mill equipment, such as rewinders, cutters, supercalenders, coaters, waxers and printing machines, each involving the application of some form of power drive. In listing only some of the more common systems of driving the beater room and the paper machine, no attempt has been made to make a critical analysis of the superiority of any one layout. The conditions of power supply and the final utilization of this power in the machine will determine what is the best form of power transmission to use.

The power transmission system of a paper mill, like its system of power generation and power utilization, should be given as much care as either of the other two phases of the power layout. Only by giving full consideration to the wide range of power transmission mediums available in the light of the power supply and its final application, can the most economical design be obtained.

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◆ NO PLANT can afford to delay modernization simply because a complete job may not be practicable at once. Do something now.—*Power*.

Lower Steam and Power Costs

By JOHN F. FERGUSON
Ferguson Engineers

THE power system of a paper mill commonly includes a steam plant to generate steam for process requirements, for the heating of buildings, and for the generation of power. A hydroelectric plant in many cases may be used to generate a part or all of the power needs.

In earlier days, and even today, a common concept was that a paper mill to obtain cheap power must be operated by water power. Nevertheless, water power is no more essential for a paper mill, generally much less, than for any other industry using a large amount of power per unit of production.

The additional investment required for the generation of all-steam power in conjunction with a steam plant required for the generation of process steam alone will be about the same as that for the generation of steam only. It would represent about 50 per cent of the total cost of the complete steam-electric power plant.

In nearly all paper mills, excepting perhaps a few of the fine mills making papers of high rag content, news mills and the like comprising a groundwood section and making paper of high groundwood content, all power can be obtained as a by-product from the steam used in the manufacturing processes. This power represents the cheapest class of power available from fuel and it will compete with water power in almost any case. This lower power cost is due partly to the lower investment of the all-steam power plant.

Disadvantage of Two Generating Plants

Mills operating hydroelectric plants for the generation of all power and maintaining a complete steam power plant for emergencies or to meet low water conditions have a double investment. In all probability this investment places such mills at a disadvantage in competition with mills equipped with an all-steam plant of the higher class. In fact, many of the mills with this double investment would be able to obtain an advantage in their over-all production costs through the proper development of their steam power resources and a disposal of their water power to neighbor manufacturers or utilities.

In general, it will be found that the total cost of operation of a steam plant for the generation of steam only plus the cost of operation of a hydroelectric plant for the generation of power will be about the same as the cost of operation of a combined steam and power plant, provided the investment in the hydroelectric plant is not much over $100 per kilowatt capacity and sufficient water power is available over the entire year. If a steam power plant is maintained because of low water conditions over a part of the year, or because of the interruptions of long transmission lines from a hydroelectric plant, then the cost of operation of a combined all-steam power plant will be decidedly less than with the two plant combination, namely, steam plant and hydroelectric plant.

If a purchased power connection is maintained to provide for the deficiency of the hydroelectric plant, then the all-steam power plant will most likely have further advantages in over-all operating costs. The paper mill purchasing all-electric power and operating a steam plant for the generation of steam for process only will have an advantage as far as its individual investment is concerned. The power bill, however, coming to such a mill at regular intervals will cover the fixed charges on a part of the investment in the utility power plant plus fuel, labor, supplies, transmission and other losses together with a fair profit. The total cost of steam and power under purchased power operations of this kind often will be from 30 to 60 per cent higher than with a high class all-steam power plant.

Lower Investment and Higher Efficiencies

Many steam power plant projects with excellent possibilities in earning capacity have been ruined by excessive investments when completed. These investments were due to over-elaborate and extensive buildings or to unneeded equipment and excessive construction costs through improper engineering.

It is just as important that the investment figures be kept down as it is to keep down labor or fuel costs or to obtain higher efficiencies in plant operation. It should be pointed out that higher plant efficiencies are not necessarily accomplished by higher investment. In some cases, in fact, it is just the reverse. For example, the lowest investment will be at the high and extreme steam pressures, in some cases up to 2,000 lb. per square inch, where all the by-product power which can be obtained from the steam used in process and in heating can be utilized. This fact is contrary to the concept of most engineers, but a study of higher standards in steam power development will reveal possibilities quite different from those which have been presented or are generally accepted on the subject.

It would be rather difficult, without having the particulars determining the steam and power conditions, to state the investment required by any paper mill power plant. In general, the investment per kilowatt capacity of steam-electric power plants for paper mills, complete in every detail, including buildings, would range from as low as $60 per kw. capacity under the most favorable construction conditions of the larger plants with capacities from 5,000 to 10,000 kw. to $100 per kw. capacity under the average construction conditions of the smaller plant approximating 500 kw. capacity. An investment of around $83 per kw. capacity might be considered as a fair estimate

for the moderate sized paper mill manufacturing medium grades of paper and having a power plant totaling about 3,000 kw. Such a figure might be reduced as much as 10 per cent for favorable construction conditions and increased as much as 10 per cent for less favorable conditions.

The investment required for a hydroelectric plant to generate all power and a steam plant for the generation of steam only for a paper mill of 75 to 100 tons capacity might be tabulated as follows:

Hydroelectric plant investment		
(3000 kw. @ $120)		$360,000
Labor	$4,500	
Maintenance, supplies and misc.	3,600	
Fixed charges on investment @ 10%	36,000	
Steam plant investment		$130,000
Fuel (24,000 tons @ $5.00)	$120,000	
Labor	10,000	
Maintenance, supplies and misc.	3,250	
Fixed charges on investment @ 11.5%	14,950	
Total Operating Cost		$192,300
Total Investment		$490,000

A plan for a similar plant involving the use of a hydroelectric station for the generation of power to the extent of the water power supply in conjunction with the steam plant for the generation of steam for process and a steam power unit of about 2000 kw. for use during low water periods might require the following investment:

Hydroelectric plant investment		
(3000 kw. @ $120)		$360,000
Labor	$4,500	
Maintenance, supplies and misc.	3,600	
Fixed charges on investment @ 10%	36,000	
Steam plant investment		$210,000
Fuel (25,500 tons @ $5.00)	$127,500	
Labor	13,000	
Maintenance, supplies and misc.	5,250	
Fixed charges on investment @ 11.5%	24,150	
Total Operating Cost		$214,000
Total Investment		$570,000

Should a steam plant for the generation of steam only and a purchased power connection for the supply of all power be used for the mill, then the investment might be itemized as follows:

Investment in steam plant and purchased power connection		$150,000
Fuel (24,000 tons @ $5.00)	$120,000	
Labor	10,000	
Maintenance, supplies and misc.	3,600	
Fixed charges on investment @ 11.5%	17,250	
	$150,850	
Purchased power 15,000,000 kw. hours @ $0.008	$120,000.	
Total Operating Cost		$270,850

A fourth plan might involve a steam-electric power plant for the generation of all-steam and power. The following tabulation indicates such an investment:

Steam power plant investment		$250,000
Fuel 27,000 tons @ $5.00	$135,000	
Labor	15,000	
Maintenance, supplies and misc.	6,250	
Fixed charges on investment @ 11.5%	28,750	
Total Operating Cost		$185,000

It will be seen from the foregoing figures that an all-steam power plant can compete easily with the combined hydroelectric and process steam plant. In fact, only the very low cost hydroelectric plant in combination with a process steam plant can compete favorably with the all-steam power plant.

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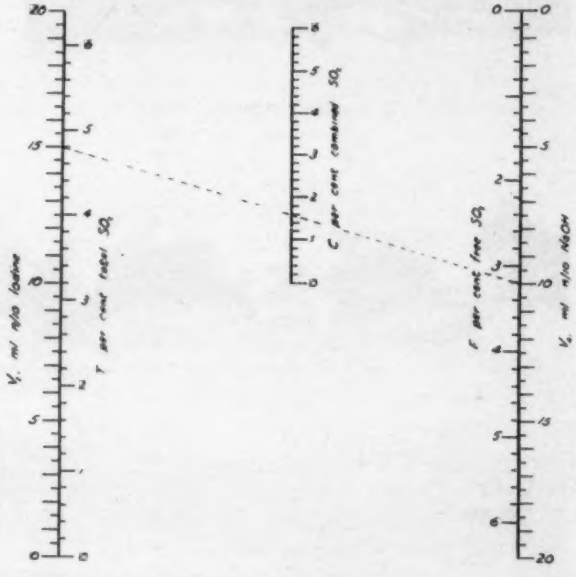
Sulphite Acid Nomograph

By D. S. DAVIS
Dale S. Davis' Associates

THE accompanying alignment chart, either as it stands or in an enlarged form, will be found convenient for use in connection with the determination of sulphur dioxide, total, free, and combined, in sulphite cooking acid.

The procedure adopted in nearly every sulphite mill requires the cook or an assistant to titrate 1-ml. samples of acid with tenth normal iodine and sodium



hydroxide. Under such conditions the percentage total SO_2, T, is given by the equation:

$$T = 0.32\ V_I$$

and the percentage free SO_2, F, is given by:

$$F = 0.32\ V_A$$

where V_I and V_A are the volumes of iodine and alkali, in milliliters, respectively. The percentage of combined SO_2, C, is then found from the equation:

$$C = T - F$$

The manner in which the three equations may be quickly solved by the chart without recourse to multiplication and subtraction is illustrated as follows: In making the titrations 15 ml. of n/10 iodine and 10 ml. of n/10 alkali are used; what are the percentages of total, free, and combined SO_2? Opposite 15 on the V_I-scale read 4.8 per cent total SO_2 on the T-scale and opposite 10 on the V_A-scale read 3.2 per cent free SO_2 on the F-scale. The broken line connecting the two points crosses the central axis at C — 1.6 per cent combined SO_2.

REPRODUCTIONS OF

By WALTER E. ROGERS
Institute of Paper Chemistry

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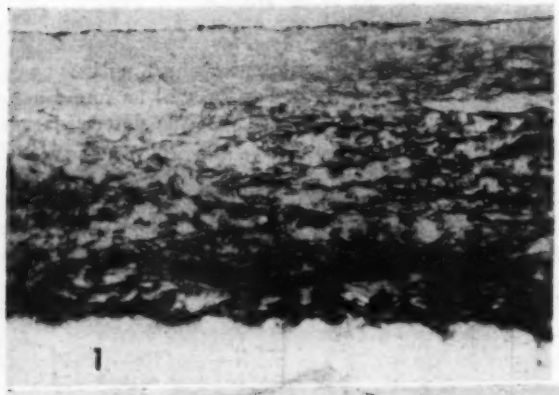
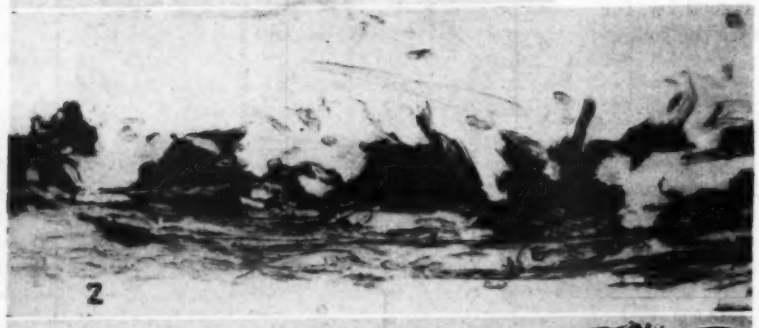
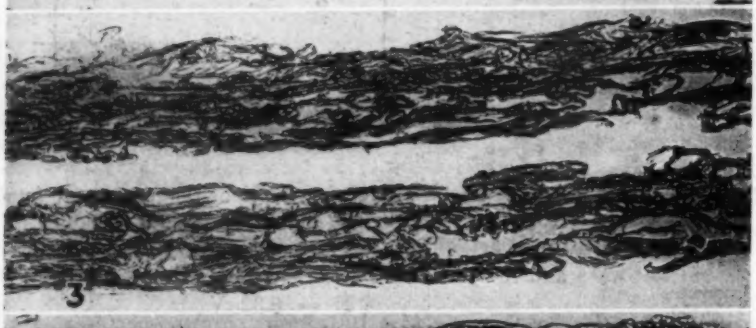
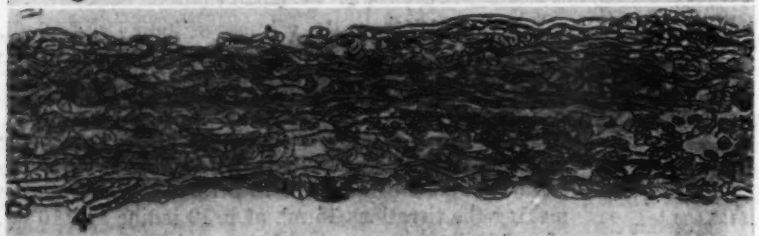
The magnification of these photomicrographs is seventy-five times in the case of all reproductions, with the exception of that of No. 1, blotting paper, which is magnified fifty times.

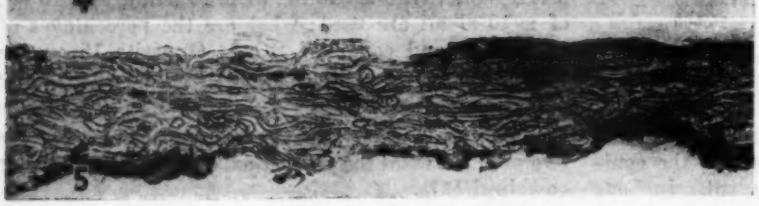
These photomicrographs were made possible through the co-operation of the Bausch & Lomb Optical Company, Rochester, N.Y.











No. 1—Blotting Paper—Section of a duplex blotting paper. The upper liner constituting approximately a third of the thickness of the paper is made from an undyed stock different from the stock of the lower absorbent layer which is dyed blue. The thin dark line along the upper edge of the section is printer's ink. The upper surface of the blotter carried a printed advertisement.

No. 2—Suede Paper—Section of suede paper. Below is the base sheet in which the fibers are rather loosely compacted. Lying on this sheet and showing black in the photograph is the layer of adhesive which is thin at some points and thick at others. Projecting upward at various angles from the adhesive are the fibers which give the paper its fuzzy surface. The sparsity of these fibers in the section is due, first, to the fact that the fibers of the layers are much more sparsely distributed than in the lower layer of the sheet, and second, to the fact that the section is extremely thin. An inch of this paper could be cut into more than two thousand of these sections.

No. 3—Newsprint—Sections of two sheets of modern newsprint. Conspicuous features are the highly irregular contour of the surfaces, the low percentage of cross fibers, and the prevalence of internal spaces or voids.

No. 4—Whatman's Drawing Paper—Section of paper on which the plates of John James Audubon's monumental work, *The Birds of America*, were printed. This is a pure rag sheet made in England in the year 1830, and is, therefore, handmade. From the standpoint of structure, this paper approaches the ideal, for almost as many fibers lie crosswise in the sheet as lie lengthwise. In the photograph the sections of cross

PHOTOMICROGRAPHS

of Paper Cross-Sections

fibers may be recognized as double circles, while sections of the fibers lying lengthwise appear as double lines.

No. 5—Old Book Paper—Section of a leaf from a book, *The Menologia for August*, which was printed in the year 1642. The even commingling of cross and longitudinal fibers revealed in this section of a handmade sheet is difficult to attain in a machine-made paper. The paper was printed on both sides and the ink of three different Greek characters is distinctly visible along the margins of the section.

No. 6—Shipping Bag Paper—Section of a shipping bag used for flour. The paper is heavily coated on one side. The coating is represented by the heavy dark layer. The particles which give opacity to the coating are clearly distinguishable as dark specks.

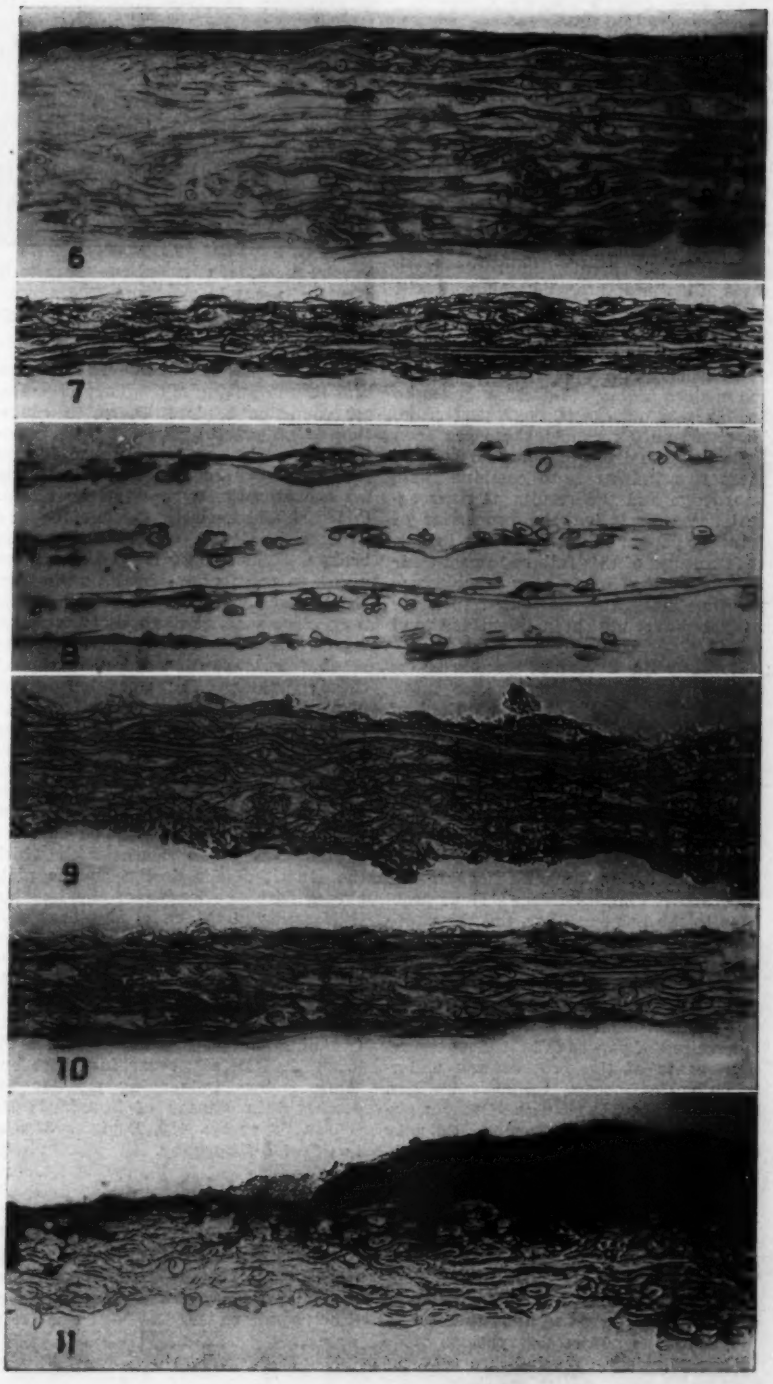
No. 7—Cornstalk Paper—Section of newsprint made from cornstalks. A thin, compact sheet with rather regular surface and very limited free internal space.

No. 8—Lens Paper—Section through four sheets of the paper used by microscopists for wiping lenses. The section shows clearly the profiles of sheets that are little more than delicate laceworks of fibers, the paper being rarely more than two fibers thick at any point, and often less.

No. 9—First American Made Paper—Section of the first paper made in America. The date of manufacture was 1710. This rag sheet was made by hand in the mill from which Benjamin Franklin obtained paper for his press. The uneven contour, above and below, represents in profile the elevations and depressions of the surface of the sheet.

No. 10—Banknote Paper—Section of a paper used for making banknotes. A pure rag sheet displaying considerable uniformity of thickness and much compactness. A noticeable feature of the sheet is the high proportion of fibers which lie crosswise in the sheet and are, therefore, cut transversely in the section.

No. 11—Letterhead—Portion of a section through a single letter of an engraved letterhead on rag bond. The surface contour of the ink layer, the thickness of the ink, the thickness of the sheet, and the degree of ink penetration into the paper are clearly shown.



The Relation of Paper Properties to Printing Quality*

By C. G. WEBER,
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Washington, D. C.

Precise measurements are necessary to find what happens to large sheets of paper in printing. The micrometer equipped rule shown here is for measuring to .001 inch, 60-inch sheets

LACK of scientific knowledge of the optimum printing properties of papers has prevented the printing industry from obtaining the full benefits of advancements in processes and equnpment.

The manufacture of paper has become a highly developed industry which employs intricate and costly machinery by means of which commodities are produced at amazing speeds. Research has made possible greatly improved processes of manufacture, and technical skill has been widely applied in improvement of quality. Printers also have made great advancement in the development of their processes and equipment, until the modern high-speed presses appear to be marvels of mechanical perfection. However, until recently, there has been little co-operative effort on the part of these two industries to combine their knowledge and the results of their experience in relating the properties of printing papers to requirements in use. It is because of this failure to pool their knowledge that many very troublesome printing difficulties attributed to paper as yet have not been identified and solved.

Recently the Bureau of Standards has been active in obtaining precise information relative to what is required of printing papers and the application of technical knowledge in finding the relation of the properties of papers to printing quality.

Register in Offset Lithography

Register difficulties with lithographic papers have long been very serious problems to the lithographers and the paper manufacturers serving them. At the urgent request of the Lithographic Technical Foundation, study of the offset printing process for the purpose of obtaining additional knowledge of all that is required of papers to best meet the requirements of the process was undertaken by the Bureau. Progress has been made in finding the causes of poor register of prints, the most serious difficulty encountered in offset printing, by observing how made to order papers responded to offset printing under carefully controlled conditions in a commercial plant. Some seventeen causes of misregister, classified as atmospheric, mechanical, water and ink, the characteristics of paper, and incidental handling, were determined and studied.

The results of the observations made in the printing plant indicate that the control of a number of factors is important in minimizing misregister. For the air conditioned plant, thorough conditioning of paper before the first printing is essential and the Paper Hygroscope[1] is very convenient and reliable for checking the hygroscopic condition. Paper should be hung for conditioning as soon as its protective wrapper is broken. When paper is opened and exposed to room atmosphere in the pile, the exposed edges and top of the pile may absorb or give up moisture, and waves, wrinkles, or buckles will quickly result from expansion or contraction of those portions. The condition of the fiber of paper is important, and an absolute minimum of beating and jordaning in manufacture of offset papers appears desirable for good register. As soon as the first sheets are printed with the first color, information that will permit forestalling poor register may be obtained by checking the closeness with which the length of the design on the plate agrees with the length of the imprint. Uniformity of thickness of plates used for the different printings on the same job is important to insure uniformity of plate stretch in clamping the plates in place, as the increase in length of the plate design due to mechanical stress in clamping the plate, will vary with the thickness. Details regarding these and other factors influencing register are discussed in Bureau of Standards Research Paper No. 480, *Register Studies in Offset Lithography.*

Reactions of Offset Printing Papers to Atmospheric Changes

Since *manufactured weather* is rapidly becoming recognized as essential for quality multi-color offset lithography, the most recent work at the Bureau on lithographic papers has been relative to its use.

Extensive laboratory studies have been made to obtain scientific data on the manner in which large sheets of paper react to changes in the humidity and temperature of the air surrounding them. Sheets, 24 inches square, of the made to order papers already referred to, were exposed to a wide range of atmospheric conditions in a room where relative humidity was controlled accurately to $\pm$ ½ per cent and the temperature to $\pm$1 deg. Fahr. Changes in dimensions were determined by measuring to .001 inch with a micrometer rule, moisture content changes were found by weighing to 1/10 milligram on a chemical balance, and the effects on strength were carefully measured by standard methods. The papers responded very rapidly to changes in the hygroscopic condition of the surrounding air. Specimens of offset papers having moisture contents corresponding to relative humidities of 28, 33, 55, 65, and 72½ per cent came to nearly constant weight in an atmosphere of 45 per cent relative humidity after less than one hour exposure, and 75 per cent of the total change in moisture content took place during the initial 10 minutes. In view of such rapid adjustment of paper to atmospheric changes, it seems obvious that multicolor printing requires atmospheric control if satisfactory production and quality of product are to be obtained.

The strength of the papers did not vary to an extent that would be of importance to lithographers under ordinary conditions. In the vicinity of 45 per cent relative humidity, a change in relative humidity of 10 per cent resulted in variations in folding endurance and tearing strength of approximately 10 per cent and had much less influence on the tensile strength and bursting strength.

A straight-line relationship was found between moisture content and dimen-

sions of the papers, the dimensions varying directly with the moisture content regardless of the cause of moisture content change. Humidity and temperature changes both affected the moisture content, the former being more important. Results obtained indicated the necessity of controlling the humidity to within ±1 per cent and the temperature to within ±5 deg. Fahr. for precise register in printing. In the studies of dimensional changes of papers with changes in moisture content, it was found that the papers which gave best register in printing changed least in the machine direction with moisture content changes. Conversely, those that gave poorest register changed most in that direction. Also, that the low machine direction changes were accompanied by high cross direction changes, indicating that large directional difference in sheet formation, that is, a decided grain in the machine direction, is desirable in offset papers. Additional studies of the optimum properties of papers for offset printing, and of the most economical handling of them, are planned to help in the further reduction of register difficulties.

Tests for Printing Papers

While the application of technical skill in the mass production of most types of papers used by printers has brought about a certain amount of uniformity of quality, much remains to be done in the way of finding more exactly the relationship between the properties of paper and its printing quality. The properties evaluated by most of the tests commonly applied to paper are not related to printing quality, and some of the properties known to be important are not yet adequately defined or well enough understood to permit evaluating by any existing tests. Printing papers have been divided into broad classes such as: newsprint, rotogravure, lithographic, bible, many grades of book, and printing specialties, somewhat roughly according to their uses. However, until we have more adequate methods of evaluating some of the properties, such as softness, air permeability, surface texture, and absorptiveness, it is not possible to determine accurately the relation each has to printing. Therefore, it is obviously essential that test methods of proven applicability be perfected, and the influence of all the properties studied. This must be done before we can specify exactly how printing papers should be made for the best results in any particular type of work, or before we can predict accurately how an available paper will react to printing, except by trial.

Testing problems in connection with the definition and evaluation of printing paper qualities, and the correlation of the qualities with requirements in use, in addition to the lithographic studies already mentioned, are given constant attention at the Bureau of Standards.

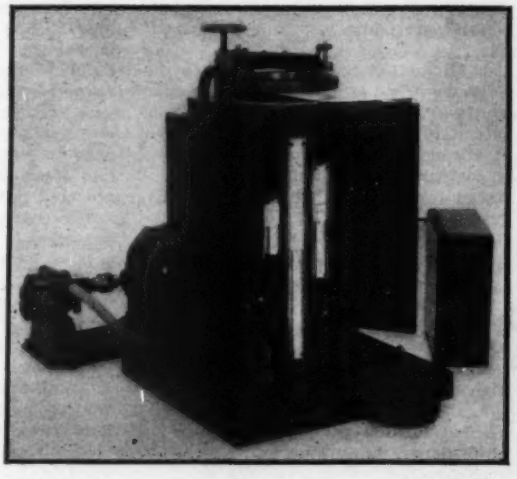
The first precision instrument for measuring the opacity of paper was developed at the Bureau, and this type of apparatus is now widely used in testing papers to find the extent to which printing will show through. Considerable attention has been devoted recently to the precise measurement of air permeability of papers. That the permeability, which is governed by the spaces between the felted fibers, is closely related to the penetration of the oil vehicle of certain printing inks is known, but the exact relation is not fully understood. From a study of all the available instruments, need for a more precise method for pursuing scientific studies was seen, and, after considerable development work, such an instrument has been designed and constructed. It is hoped that the very precise determinations made possible by this instrument will permit a better understanding of the behavior of printing papers with respect to absorptive qualities. Ink reception in news, rotogravure, and mimeograph printing, where, because of the nature of the ink vehicle, oil penetration plays an important role in drying, can then be more clearly comprehended. Various types of letterpress, offset, and engraving inks have oxidizing oils as vehicles and the degree of penetration of this type of ink appears to be a minor factor. Little reliable information is available regarding the factors which influence the reception of such inks by different papers, and such information must await the development of methods of determining the surface "wettability" of the papers.

The quality of permanence or lasting quality has long been a matter of concern to all interested in the preservation of printed documents. The service life of printed records is obviously dependent on the longevity of the paper, and intelligent selection of papers with respect to permanence requires careful testing. One important objective of extensive investigations of the permanence of papers carried on at the Bureau has been that of relating definite paper properties with lasting quality, and the development of suitable tests for evaluating those properties. An accelerated aging test was developed to simulate the ravages of time on papers. Then, using this test in lieu of waiting for the passage of scores of years, the relationship between such properties as we are able to define, and the indicated permanence qualities of a great number of special papers were determined. In this study, a large number of papers were made in the Bureau mill, and the different properties were varied in turn to find the effects of each. Data already obtained now indicate that the relative lasting quality of a paper can be predicted quite satisfactorily. This is done by using recently developed tests for purity of the fibers, acid content, and freedom from other harmful ingredients such as excess rosin in conjunction with the influence of the accelerated aging test on purity and strength. Also, with the information now available, it appears possible for the paper user to specify what he wants with respect to properties that will assure lasting quality. The test methods involved are described in Bureau of Standards publications, and in official or tentative methods of the Technical Association of the Pulp and Paper Industry.

Progress is being made toward collecting additional data to assist in defining and evaluating the characteristics of papers essential for better results in printing. However, the problems involved are many and complicated because of the numerous variables which influence the properties, and the lack of exact knowledge concerning the relationship between many of the properties and results in printing. Progress has been made in relating fundamental properties of lithographic papers to behavior in printing and much of the guesswork has been eliminated in the selection of other printing papers. The work is only begun, however, as much additional research must be done before the user of paper will be able to so define the requirements of each process that the manufacturer can satisfactorily build papers to meet all of the requirements. In this field, our technologic development has failed to keep pace with the great mechanical advancements in papermaking on the one hand and high-speed printing on the other.

(*) Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

[1]Reed, R. F., The Paper Hygroscope, Lithographic Technical Foundation, Inc., 220 E. 42nd Street, New York City.



The air permeability of printing papers, being governed by the spaces between the felted fibers, gives a clue to the ink penetration. A precise instrument recently developed at the Bureau of Standards for studying air permeability is shown in illustration

Oil Chemists Discuss Paper

WHICH color of paper is the best for wrapping foods? This may be not only a matter of aesthetic taste, but may also have something to do with physical taste, at least if the food contains fats that might become rancid. This and other interesting things about paper were incidental to the fall meeting of the American Oil Chemists' Society, held at Chicago October 12 and 13.

Chemists in soap manufacturing, packing house, butter, cheese and other plants are concerned with paper and board in connection with the keeping, wrapping and shipping of their products, as well as their display values. The subject of paper, therefore, was represented by a committee report, two papers and many incidental references.

The Society has recently appointed a strong committee, under the chairmanship of L. F. Hoyt, of the research department of the Larkin Company of Buffalo, to study the problems incidental to the use of paper and printing ink in wrapping soap. This committee is cooperating closely with a committee appointed by T. A. P. P. I. to devise methods of testing papers for soap wrap. The chairman of the latter committee is T. L. Crossley of Toronto, who is also a member, by request, of the oil chemists' committee.

The program of the meeting covered methods of analysis and manufacture of fats, oils and glycerine, with recent investigations in the field of edible oils and vitamins.

Paper and Ink

Mr. Hoyt said that, owing to the short time since appointment, it would be premature to do other than announce a plan of action. His committee had met twice and a representative of the T. A. P. P. I. committee had been present at both meetings.

The tentative program of this committee comprises the following forms of test:

1. Spot test, using three strengths of caustic soda: ½, 1 and 2 percent, by a definite procedure proposed by Dr. Ittner.

2. Extraction of the paper with distilled water, as proposed by Mr. Crossley of the T. A. P. P. I. committee. The extract is treated with a definite amount of normal soda and the color produced is compared with standard comparates. These tests are to be made with five grades of paper:

(a) Newsprint
(b) Book, ⅓ soda, ⅔ sulphite
(c) Book, ⅓ sulphite, ⅔ old papers
(d) Blotting
(e) 100 per cent bleached sulphite, well sized.

This test appears to have the advantage of a measured expression.

3. Effects of freshly cut soaps on inks printed on 100 per cent bleached sulphite paper, using four colors on different sheets of the same paper. This is to be a contact test using collaborator's own soap, but under a standardized procedure as to time, temperature and pressure. Two forms are suggested:

(a) The printed wrapped is placed between freshly cut bars of soap and kept under a pressure of two pounds per square inch for 16 hours at room temperature.

(b) Contact with a soap solution of defined strength and conditions.

Contact tests with freshly cut soap are difficult to standardize and reproduce in other laboratories, but it is considered an important test by soap manufacturers.

Wrapping Laundry Soaps

"Packaging of Laundry Soaps" was the title of a paper by F. E. Boyce of Omaha. He spoke of the unsatisfactory character of groundwood and unbleached pulps, owing to their staining with alkaline substances in the presence of water. In his opinion, bleached sulphite is an ideal source of paper for soap wrap. He had found some difficulty with parchmentized paper in connection with fast printing press work.

Speaking of the reaction of alkalies on printing ink, and methods of testing ink for this use, Mr. Boyce noted that sweating may damage ink that has stood the test of immersion in alkaline solutions for twenty-four hours.

The alkaline character of laundry soap limited the range of colors that might satisfactorily be used on wrappers, preventing the printer from giving them a more attractive appearance.

One of the troubles with soap cartons mentioned by the speaker is the growth of molds. He had been told that such troubles were not noticed while European pulps were being used, but became prevalent when North American pulps were used. He questioned if that were a fact. Proper storage facilities are necessary to prevent this trouble.

Paper Processes Affect Packaging

"Paper Processing for Package Purposes" was discussed by T. Linsey Crossley of Toronto, with the help of a number of lantern slides. The wide range of package types and the complexities arising from the character of articles packed, was typified by the difference between the wrapping of a stainless steel cigarette case and a stick of chewing gum.

The indirect relationship between the papermaker and the package maker was said to be a difficulty. Often the paper is bought by the printer who does not use it, from the jobber who does not make it. Therefore, it seems very desirable that a closer connection be established.

Alkali-proof is not a correct description of paper for soap wrap. Soaps seldom contain a measurable amount of free alkali, and might even have an excess of fatty acid. By lack of knowledge, an oily substance is at times wrapped in waxed paper, while a moist substance is put up in a grease-proof wrapper.

Methods of preparing pulps have a marked influence on their value in paper for package purposes. It was brought out that groundwood pulp containing all the constituents of wood, contains some that react with all alkaline substances, silicate or caustic, giving a yellow stain.

Unbleached pulps also contain some of these substances that stain yellow with alkaline matter. Bleaching the pulp in large measure eliminates the staining material. Rag papers are too costly in most cases, hence bleached sulphite and soda pulps are the most satisfactory fiber base.

The process of beating was described in some detail to show the difference between blotting paper at one end of the scale and parchment types at the other. Sizing and coloring were taken up, and the effects of the jordan, fourdrinier, presses, dryers and calenders on the various types of paper used for packages.

Butter Wrapping

Incidental to a paper by Dr. F. W. Bouska, which had to do with butter (1,600,000,000 pounds of which was consumed last year by the people of the United States), the question of wrappers came in for some mention. The speaker stated that paper which he had used had generally been very satisfactory, but occasionally it had failed by weakening more than usual when becoming wet. In cases where molds developed, it was his view that the majority of those troubles arose from the butter and not from the paper. A member expressed the opinion that high percentage of water soluble extract in the paper might add to the tendency to mold, citing a suggested maximum of 1.3 per cent.

Dr. Bouska said in reply there might be a small amount of dextrine in the paper, due to reaction with sulphuric acid in its treatment for parchmentizing, and that this would contribute to the development of molds. He said that he liked a paper to be porous enough to permit the slow evaporation of moisture and access of air, without extruding the fats, and one that would not break readily when moistened.

Vitamins and Rancidity

Of interest to paper makers, along with everyone, is the matter of dietary standards, with which we have been trained to associate the word "vitamin." In mill communities there is often the matter of undernourished children, and it may therefore be worth while to mention an experience related by Dr. Dorothy Whipple of the University of Pennsylvania.

Their attention was drawn to the fact that when children who had been taken

out of school on account of undernourishment and kept for a while in a hospital were sent home and given the same food routine as they had in the hospital, they began to lose weight again. After considerable experimenting with animals, it was found that the trouble arose from the poor attention given to the cod liver oil. It is probably news to many that cod liver oil loses its special value unless kept cool and used while fresh.

A matter of further interest was brought out in the point that edible oils do not become rancid when kept away from white light, and in some cases from blue and red lights. Bottles of edible oils keep better then wrapped in green paper.

It is apparent that paper orders for wrapping salad oil bottles or salted nuts will more than likely call for specific keeping qualities.

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◆ T. A. P. P. I. Meetings Scheduled

The 1934 annual meeting of the Technical Association of the Pulp and Paper Industry will be held in New York City at the Waldorf Astoria Hotel, February 19-22, 1934.

The 1934 fall meeting will be held at Portland, Ore., August 28-31. It is necessary that plans for this meeting be made well in advance and it is advisable that those who wish to attend communicate with the committees for information as to transportation and hotel facilities. A transportation committee to attend to details of the trip has been appointed, and those wishing further information should communicate with G. S. Brazeau, Weyerhaeuser Timber Co., 307 N. Michigan Ave., Chicago, who is chairman of that committee.

Portland Surrounded by Many Large Mills

The following brief resumé of some of the large paper mills near Portland has been furnished by B. T. McBain, well known pulp and paper mill specialist and member of T. A. P. P. I. This information will be of particular interest to those who expect to attend the meeting.

The Pacific Coast membership of T. A. P. P. I. includes many British Columbia pulp and paper mill men as well as the Pacific Coast States of the United States, some 160 in all. The pulp and paper industry of the Pacific Coast extends from Speel River in Southeastern Alaska to Pomona, Calif., some 60 miles southeast of Los Angeles, a distance north to south of about 3,500 to 4,000 miles.

A large number of important mills of this section are located within a short distance of Portland, and those who attend the meeting will have the privilege and opportunity to see some of the largest mills on the coast.

On the Willamette River at Oregon City, Ore., is the plant of the Hawley Pulp and Paper Co., with a 234-in. machine operating at 1,200 ft. on newsprint, and three other machines on sulphate wrapping, towel and tissues. At West Linn, Ore., is the plant of the Crown Willamette Co., with nine machines; one machine operating at 1,100 ft. on newsprint, driven by the first sectional drive that General Electric ever built, and eight others with all auxiliary sulphite and groundwood equipment for 350 tons daily.

Farther up this stream is the 100-ton unbleached sulphite plant of the Spaulding Pulp & Paper Co., and still farther is the 100-ton bond and glassine plant of the Oregon Pulp & Paper Co. at Salem with its own bleached sulphite mill.

Out of Portland on the Columbia River are the Columbia River Paper Mills at Vancouver, Wash., with two fourdrinier machines and the first all waste wood sulphite mill ever built and successfully operated with its own lumber mill and papermaking plant.

At Camas, Wash., only 20 miles from Portland, is the 300-ton, 13-machine specialty plant of the Crown Willamette Company, making everything from sulphite, sulphate and groundwood pulps to fine bond paper, bread wrap, orange tissue and heavy kraft and mill wrappers, the only mill on the Pacific Coast making everything "from soup to nuts," so to speak.

Next, there is the kraft pulp and paper mill of the St. Helens Pulp & Paper Co., at St. Helens, Ore., with two large paper machines making both bleached and unbleached kraft papers and paper bags. This plant is only about 30 miles from the center of Portland, and, like the others, is reached both by rail and water, as well as by concrete highways.

At Longview, Wash., only 50 miles down the Columbia River, there are three concerns:

(a) A chipboard mill operated by the Pacific Strawboard Paper Company, making in the neighborhood of 50 tons daily.

(b) Longview Fibre Co., with three papermaking machines; one for board, another, the largest American made Yankee, and the third a Minto dryer fourdrinier on lightweight papers, probably a total production of 150 tons daily.

(c) Weyerhaeuser Timber Co., with a 200-ton daily production of bleached sulphite pulp, the newst on the Pacific Coast, drying pulp with Minton pulp dryer and supplying the highest grades of pulp to the paper mills of the East and Middle West by water and/or rail.

There are other mills in Oregon and Washington easily reached from Portland. There is Lebanon Paper Co., division of Crown Willamette Paper Co., 100 miles distant, with three papermaking machines; the Shelton bleached sulphite pulp mill, 150 miles away, is near Olympia, the State capital; Hoquiam, 160 miles away, is the mill where Hammermill Paper Company makes Management bond; and at Everett, the Everett Pulp & Paper Co. manufactures book and magazine papers, and so on up the coast to the British Columbia line.

Visitors will have the opportunity to visit these paper and pulp mills.

◆ Divisional Supers Meetings

The Northern New York Division of the American Pulp and Paper Mill Superintendents Association held its fall meeting October 20 and 21 at Hotel Seneca, Rochester, N. Y. The first day of the meeting was devoted to registration and a visit to the paper mill of the Eastman Kodak Company at Rochester. This feature of the meeting was considered a great privilege and was thoroughly enjoyed by those in attendance.

At the business sessions of the second day, the following interesting papers were presented: John R. Roberts of E. I. duPont de Nemours & Co. spoke on color problems connected with fillers; Warren Slocum, of Baush & Lomb Optical Co., demonstrated the company's new Opacimeter; and Dr. H. S. Bristol, of the International Paper Company, discussed pH control.

B. D. Milliedge of the Howard Smith Paper Mills, Cornwall, Ont., was elected chairman for the coming year.

On October 28, the fall meeting of the Pennsylvania-New Jersey Division of the Superintendents Association was held at the Benjamin Franklin Hotel, Philadelphia. The sessions were marked by the presentation of a number of interesting papers, as follows: "N. R. A. and the Mill Superintendent," by E. C. Gildenzopf, Schmidt & Ault Paper Co.; "The Paper Machine Press," by F. L. Barstow, U. S. Rubber Co.; "The Most Economical Way to Prepare Stock for the Paper Machine," Mark C. Osborne, Dilts Machine Works; "Automatic Mechanical Control and Direct White Water System," Melvin R. Ware, inventor; "Waste Paper," P. M. Loddengaard.

Robert L. Eminger, national secretary of the Association was a guest at the meeting.

◆ Major R. Y. Stuart

Major R. Y. Stuart, chief United States Forester, passed away October 23, at the age of 50, as the result of a fall from the window of the government building in Washington.

Major Stuart was a prominent figure in the forestry service, having spent practically his entire life with the exception of the time spent in France with the A. E. F., he had devoted practically his entire life to the work of forestry. Major Stuart was the first forestry expert to be consulted by President Roosevelt in planning the program for the civilian conservation forestry corps.

S. A. Silcox, timber expert, has been appointed to succeed Major Stuart as chief Forester.

◆ THE AMERICAN Institute of Chemical Engineers has changed the dates of its national meeting from December 6-8 to December 12-14, Roanoke, Va. The change of time was made to make it possible for the members to conveniently attend the Fourteenth Exposition of Chemical Industries, which will be held at Grand Central Palace in New York City, December 4-9, 1933.

◆ Pyro Surface Pyrometers

The Pyrometer Instrument Company, 103 Lafayette Street, New York City, has developed a line of surface pyrometers that are portable, compact and ruggedly constructed.

In using one of these instruments it is not necessary to read the temperature simultaneously with the contacting of the surface to be measured. While contacting the thermocouple plate of the instrument, a red button on the face of the indicator is pressed and held in the pressed position for a few seconds. The pressure on the button is released before removing the thermocouple from the surface being measured, and in so doing a fixed indication of the temperature measurement is obtained. Another pressure on the red button causes the pointer on the indicator to return to its zero setting.

Such an instrument may be obtained in any one of three types which have been designated as Type "A," Type "B," and Type "C."

Type "A" utilizes an offset handle, is designed for flat surfaces, and is furnished in the following ranges: 20 deg.-

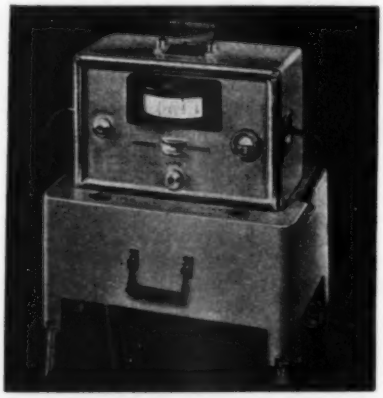
400 deg. Fahr., 20 deg.-600 deg. Fahr., 20 deg.-900 deg. Fahr., and 100 deg.-1400 deg. Fahr. Type "B," a "Bow Type," is designed for use on curved surfaces and has a standard range of temperature measurement of 10 deg.-400 deg. Fahr. Specifications for Type "C" are the same as for Type "A" except that the contact consists of a block of lead with three legs and with one of the legs containing the thermocouple. This type is designed for applications where the rise in surface temperatures is to be determined over a period of time.

◆ Combustible Gas Analyzer

Model RZA gas analyzer, an instrument that has been featured recently by Bacharach Industrial Instrument Company, 7000 Bennett Street, Pittsburgh, Pa., has been designed for the automatic continuous measurement of combustible components of gaseous mixtures. It is recommended by the manufacturers as an ideal instrument for the analysis of the atmosphere of furnaces in which a reducing atmosphere must be maintained.

The analyzer operates on the principle of catalytic combustion. A sample of the gas to be analyzed is passed at a constant velocity through a gas cell containing an electrically heated platinum wire. The combustible gases in the sample are burned catayticaly along this wire, and the electrical resistance of the wire is then compared with that of an identical wire mounted in another cell. This cell contains air and is sealed.

The analyzer is said to be very sensitive, and that a full scale deflection can be obtained on a small percentage of



combustible gases. The scale of the indicator is calibrated to read directly in per cent of combustible gases, the standard range being from 0-20 per cent. Other ranges may be obtained by changing orifices.

This instrument, designed for either portable service or permanent installation, operates automatically from any 110 or 220 volt outlet, the analysis appearing on the scale of the instrument after it starts to operate in less than twenty seconds.

◆ Loose Pulley Oiler

The Vosta oiler has been developed recently by The Lunkenheimer Co., Cincinnati, Ohio for use on loose pulleys.

It consists of a glass body and bronze base in which a tube is mounted, extending to near the top of the bottle. As

the pulley revolves, the oil is thrown outward by centrifugal force. Feeding is governed by the thermal principle—periodic expansion and contraction of air within the reservoir due to temperature changes.

◆ Portable Electric Grinder

A new high-speed portable electric tool for rough off-hand grinding, for touching off parts, tools and dies, and for various grinding and sharpening jobs has been announced by the Chicago Abrasive Wheel Co., 1101 West Monroe St., Chicago.

The tool, operated through a universal motor, has a maximum speed of 17,000 r.p.m. It may be plugged in on either

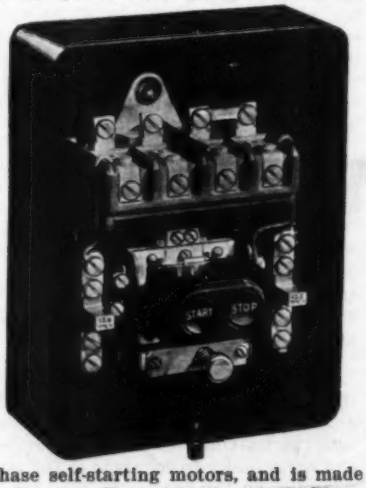
alternating or direct current of 110 volts. High-speed, dust-sealed ball bearings are used to reduce friction.

Furnished as standard equipment with this so-called Hand-ee Hi-Power grinder, besides three grinding wheels, are a dressing stone, necessary wrenches and a 10-foot rubber-covered cable with soft rubber attachment plug. The entire outfit is supplied in a compartment box container.

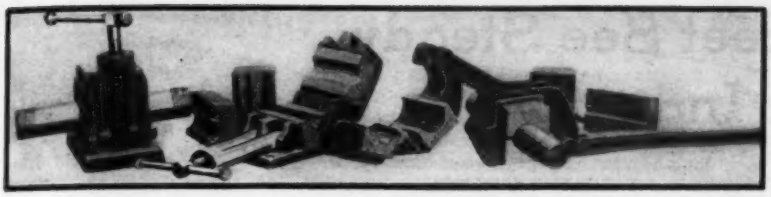
◆ Automatic Across-the-Line Switch

A new solenoid-operated across-the-line starting switch has just been announced by the Allen-Bradley Company, 1311 S. First Street, Milwaukee, Wis.

It is rated at 5 hp., 220 V.; 7½ hp., 440-550 V. for polyphase motors, and up to 1½ hp., 110 V.; 3 hp., 220 V. for single



phase self-starting motors, and is made in 3 forms: Form 1, with start and stop push buttons; Form 2, without push buttons, for thermostat or remote pilot control; Form 3, with 2-way hand-automatic switch for "try-out" control installations.



◆ Vise and Wrench

Wolverine Industries, of Harbert, Mich., have recently placed on the market a line of vises and wrenches designated as Velvo-Grip. These tools employ the principle of cushioning grip on materials by the use of wood jaws which are interchangeable, and are made of standard 2 in. by 4 in. lumber. They are treated to prevent checking or shrinking and lock in position when pressure is applied and release when lightly tapped.

The vise consists of a two-part malleable iron frame, a set of cushion jaws for standard size materials as ordered and a screw yoke. The lower part of the frame forms the base, 5 inches by 10 inches, with one-half inch bolt holes for fastening in position. In one end of this base is pivoted the screw yoke and to the other is hinged the upper half of the frame. The wrench also has a two-part frame, but depends on a cam action for its grip. The handle is so placed with relation to the two halves of the frame that the greater the pressure applied on the handle, the tighter the material is gripped. It will not release from work until opened by the operator, yet takes a new hold with but little movement of the handle.

Both tools open in a wide angle for easy clearance of materials and operate in any position.

◆ Bale Handling Grab

The Cleveland Tramrail Division of the Cleveland Crane and Engineering

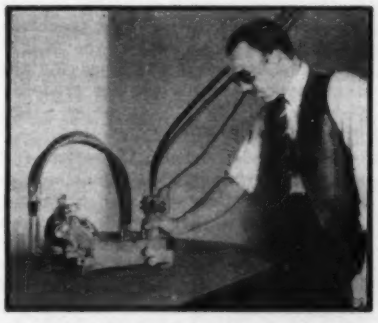
Company, Wickliffe, Ohio, has recently perfected a grab for handling waste paper, pulp, straw, bagasse or any material or product in baled form which can be pierced without damage.

This grab consists of suitably arranged screws which are especially designed for the material to be handled. The screws are rotated by a motor and gear mechanism and penetrate the material or container a sufficient depth to lift the load. On loosely baled materials mulitple units of this grab can be arranged on a spreader or load bar to lift the bale at several points. This same arrangement can be used for lifting multiple unit loads.

◆ Portable Cutting Machine

A portable cutting machine weighing but 43 lb. has been announced by The Linde Air Products Company, 30 East 42nd Street, New York City, as an addition to its Oxweld line of apparatus. It is known as the Secator.

Combining the portability of a blowpipe with the accuracy and finish of a cutting machine, it is claimed that the



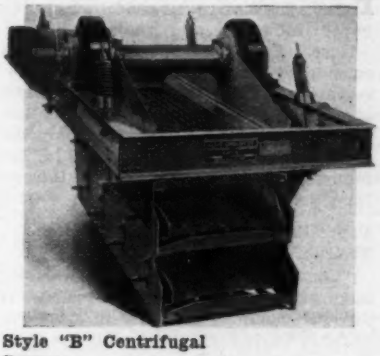
Secator makes it possible to do high quality cutting anywhere in the shop or in the field. The blowpipe can be adjusted vertically and horizontally and also to cut bevels up to 45 deg. Cuts are stated to be so clean and smooth that for many purposes machining is unnecessary.

◆ Vibrating Screens for Wood Chips

Two improved vibrating screens for sizing wood chips and many other materials have been announced by Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

One screen designated as Style "B" Centrifugal, built with one, two, or three decks in sizes from 2 feet by 6 feet to 5 feet by 14 feet is adaptable for heavy loads and the maximum range of material size. The entire screen is cable and spring suspended. Screening is by a rapid mechanically-produced eccentric motion. It's driving mechanism is conveniently located above the screen and can easily be removed or replaced.

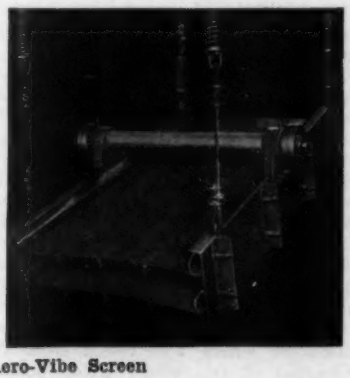
The second screen, the Aero-Vibe is suspended from a supporting structure by cables and springs. A rapid, adjustable, vibrating motion is produced by counterweighted wheels mounted on the drive shaft attached to the screen body.



Style "B" Centrifugal Screen

This screen is available in single and double deck, and in sizes from 1½ feet by 3 feet to 4 feet by 8 feet. It is designed for handling medium to fine size materials and for limited tonnage.

Both types of screens have anti-friction bearings which are Alemite lubricated and enclosed in dust-proof housings. Screen surfaces of wire cloth or perforated plate are supported on longitudinal rubber-protected bars and held



Aero-Vibe Screen

in uniform tension by special clamp plates extending the full length of the screen bodies. Screen surfaces are reversible and easily removed or replaced. Drives for the screens are generally through dust and moisture-proof Texrope V-belts from totally enclosed motors.

Such screens can be rotated in either direction. When rotated toward the feed end, the material passing over the screen surfaces is somewhat retarded.

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◆ THE AMERICAN ROLLING MILL CO., Middletown, Ohio, announces that it will hereafter manufacture and distribute stainless steel sheets, strips and plates. Stocks in all sizes and gauges have been built up so the company would be able to serve the trade immediately upon the announcement that it had entered the stainless steel field.

Dun & Bradstreet See Steady Gain by Paper Industry

FROM time to time Dun & Bradstreet, Inc., have reviewed conditions in the paper industry, and their published releases of this information are always considered as authentic and very conservative. Their most recent resume of conditions in the paper industry has just been released and confirms the optimistic views of many within the industry. The complete text of this release is published hereafter *in toto*.

Paper Industry in Best Position in Two Years

"Conditions in the paper industry have paralled, in a large measure, the general business trend. In the outburst of buying activity during the early Summer, when inflation ideas were rampant and prices were being carried upward rapidly, there was a rush to replenish stocks, which had been allowed to reach the point of exhaustion, and there was heavy buying against rather long-distance requirements. By the close of September, this buying fervor had spent most of its force, and since that time covering has been confined to moderate current replacement needs. The present levelling-off process is considered advantageous for the trade, as considerable hesitation has appeared because of the delay in signing the codes for the paper and other industries.

"Compared with conditions prevailing a year ago at this time, when the industry was harassed by the most disastrous price situation in its history, and tonnage and dollar volume of paper sales were receding uninterruptedly, the progress which has been made since April has been definite and pronounced. In addition, the outlook is more favorable than at any time since 1929, most firms are in a better financial position and profit possibilities will be enhanced by the closer cooperation among manufacturers which will result from the adoption of the code. After present stocks will have been depleted, business is expected to proceed at a more even keel, with few price fluctuations, which will tend to make conditions more satisfactory in all branches, according to a survey of the paper industry, which has just been completed by DUN & BRADSTREET, INC.

Production at Peak in Summer

"During the Summer months, most of the paper mills practically were operating at capacity" the survey continues. "Starting with June and continuing to the latter part of July, a large volume of orders was placed with mills by distributors, mainly in anticipation of price advances. Stocks of paper merchants were low and consumers' stocks also needed replenishing, making brisk business in all divisions. As orders grew more voluminous, mills were rather hesitant about accepting these at the low prices current, and adopted a ruling that future business could be placed subject to prices prevailing at the time of delivery or subject to any extra cost due to the N.R.A. These restrictions soon stopped the flood of orders received by the mills, although sufficient business had been booked to keep operations undiminished throughout the Summer.

"After prices had been advanced on most items, and wholesalers and retailers were fairly well stocked, business dropped off perceptibly in September and the downtrend continued during October. In paper board mills, however, operations still are proceeding at near capacity, while demand for boxboard is fairly persistent. Fine paper mills are less active, but output of tissues continues in good volume. The wide increase in newspaper advertising is reflected in the heavier demand on newsprint manufacturers. Manufacturers' sales from July 1 to October 1 averaged 35 to 40 per cent higher than during the comparative months of 1932, with practically all holiday contracts placed. While manufacturers of fine print paper find that the increased margin of profit, because of higher prices, is sufficient to defray the advanced costs under the N.R.A. code, this does not hold good for the manufacturers of the cheaper grades.

Gain in Sales General

"The total of wholesale orders during the first nine months ran as high as 20 per cent above last year's record, despite the fact that for the first four months sales dropped below the reduced 1932 level. From June 1 to September 1, orders for industrial and wrapping papers increased almost without interruption, both dollar and tonnage volume rising to the highest level in two years. As much of this activity sprang from the desire to accumulate inventories beyond current needs, because of advancing prices, demand since October 1 has been receding gradually. While the demand from the printing trade for paper has been better than it was last year, the improvement has not been continuous, and unevenness has been particularly in evidence since the latter part of September.

"With retailers, general sales thus far this year have reached a total approximately 25 per cent higher than the comparative 1932 figure, with the sales of wrapping paper and corrugated paper boxes higher by an even wider percentage. To a great extent, the best-selling items have been the cheaper grades. With the lower-priced papers advancing, however, in greater proportion than the higher-priced grades, there already is a strong shift to the latter items. Sales of wrapping and coated paper, towels, drinking cups, and other goods, which come under the general head of expense items, picked up in May and rose continuously until the volume in August reached the highest total in five years. Since the middle of September, there has been a gradual recession, as the buying public has not reacted as favorably as expected and retailers now are stocked up awaiting further developments.

Price Uptrend Checked

"Prices of most paper items have been advanced, but the percentage of mark-ups has been less than in many other industries," the survey points out. "Those items which had become quite demoralized naturally were the first to be raised, these including chiefly kraft, kraft bags, gummed tape, sulphite bond, the lower grades of stationery stock, some of the book papers, and many materials. Prices in general have increased from 5 to 60 per cent, with the largest mark-ups in corrugated paper boxes, wrapping paper, and industrial grades.

"Collections on current sales are reported as good, and some reductions are being made on old indebtedness; the average approximately is 20 per cent better than for the same period last year. Many firms, however, are finding it difficult to pay for the large quantities of merchandise purchased earlier in the Summer, and others cannot pay because their customers, in turn, have yet to settle their accounts. In some cities, the local paper trade associations have adopted a new set of credit rules, which compel all accounts to be paid on a 90-day basis, in order to avoid the penalty of being placed on a C.O.D. basis.

Failure Record Improving

"The number of paper manufacturers going into bankruptcy during 1933 will be larger than it was last year, as for the first nine months there were as many mills forced out of business, because of financial difficulties, as there were for the entire twelve months of 1932. There has been no decrease either in the defaulted indebtedness of these manufacturers, as the monthly average is about at the same figure it was last year, when an all-time high was reached.

"In the wholesale and retail division, however, there has been an encouraging decrease in both the number of firms defaulting and in the monetary loss involved. For the nine months of 1933 only 15 failures were listed, as compared with the record high of 35 for the twelve months of 1932, while the monthly average of liabilities was reduced by 44.1 per cent."

The complete insolvency record of the paper industry since 1927, including the nine months of 1933, as compiled by DUN & BRADSTREET, INC., shows:

Paper Manufacturers

Year	Number	Liabilities
1927.....	5	$2,017,000
1928.....	5	816,900
1929.....	10	1,959,200
1930.....	3	821,226
1931.....	1	800,000
1932.....	9	2,613,450
1933*.....	9	1,884,189

Paper Wholesalers and Retailers

Year	Number	Liabilities
1927.....	19	$1,128,800
1928.....	20	495,707
1929.....	7	67,592
1930.....	14	210,300
1931.....	6	192,100
1932.....	35	1,034,347
1933*.....	15	433,885

(*) January to September, inclusive.

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◆ Life's Greatest Chemical

In the October number of the *Industrial Bulletin*, published by Arthur D. Little, Inc., Cambridge, Mass., there appears an interesting article on Chlorophyll. "Chlorophyll, the green material of plants, has come prominently to our attention through the recent honoring of two great chemists who have spent years in the elucidation of this remarkable chemical compound. The German worker, Richard Willstätter, was presented the Willard Gibbs Medal at Chicago, and the American James B. Conant has been elevated to the presidency of Harvard University. Many other great chemists have been thrilled to work with this complex chemical of such fundamental importance to all life. Only within the past few years has the complete formula been perceived, and even yet not all the atoms and bonds are placed beyond dispute.

"The hemin or red coloring matter of blood is closely related to chlorophyll, and was probably derived from it ages ago. It has iron in place of the magnesium of the chlorophyll. Willstätter recently stated the principal characteristic of animal chemistry as oxidation, catalyzed by the iron of the blood hemin, and of plant chemistry as reduction, catalyzed by the magnesium of the chlorophyll. With the aid of the chlorophyll granules in plants, employing the energy of sunlight, carbon dioxide is converted into sugar, and from that into starch and cellulose: food, reserve food, and structural materials, respectively. Animals ultimately subsist on plants, which in turn utilize the services of chlorophyll. It may not be too much to call chlorophyll the most important organic chemical, for it has made possible life, as we know it, on this earth."

◆ National Paperboard Ass'n Elects Officers

Important changes in the National Paperboard Association, to permit proper functioning under the National Recovery Act, were effected at a meeting held in New York City, October 11, 1933.

Officers elected were: Sidney Frohman, of the Hinde & Dauch Paper Co., Sandusky, Ohio, chairman; W. J. Alford, Jr., of the Continental Paper Co., Ridgefield Park, N. J., vice chairman; H. S. Adler, secretary and treasurer.

At this meeting revised constitution and by-laws were adopted. Under the new constitution, the association is being incorporated under the laws of the State of Delaware as a corporation, not for profit. The Executive Committee, which was appointed at the meeting, was urged to contact authorities at Washington as quickly as possible, so as to remove any obstacles that might delay the approval of the industry code.

◆ William T. Elkinton

William T. Elkinton, chairman of the board of the Philadelphia Quartz Co., Philadelphia, passed away October 25, at the age of 73. He was the third generation of his family in the business which celebrated its centenary in 1931, and the seventh generation of the Elkinton family in America.

The deceased is survived by his widow, a son, Thomas W. Elkinton, president of the Philadelphia Quartz Co., and a daughter. His brother, Alfred C. Elkinton of Berkeley, Calif., is president of the Philadelphia Quartz Co., of California, Ltd.

◆ CHARLES W. CHABOT, for 18 years associated with Hammermill Paper Co., Erie, Pa., as advertising manager and more recently as vice president in charge of distribution, has joined the staff of the Robert E. Ramsey Organization, Inc., New York City, as head of a Department of New Business.

◆ ACCORDING to a report, the Mead Paper Board Co., of Chillicothe, Ohio, has purchased the Old Island Paper Mill plant at Menasha, Wis., and will employ about 100 workers in operating it.

◆ Improvements at Rhinelander

Improvements in the neighborhood of $150,000 are now being made by the Rhinelander Paper Co., Rhinelander, Wis.

A new roof has just been completed over one of the main machine rooms, and construction is already under way for an addition to the mill to take care of storing and machining of supercalender rolls.

The company also states that a contract has been placed for a new Babcock & Wilcox boiler rated at 834 hp., to be stoker fired for 400 per cent rating. This boiler wil be built for 425 lb. per square inch operating steam pressure.

◆ STEBBINS Engineering & Manufacturing Co., Watertown, N. Y., is preparing four digester linings for shipment during the coming month to the India Paper Pulp Co., Ltd., Naihati, India. The company will send skilled workmen to make the installation. The interesting feature of this order is that it is a repeat order, similar installations having been made by the Stebbins Company at this plant several years ago.

◆ Catalogues and New Publications

Farrel-Birmingham Co., 437 Vulcan St., Buffalo, N. Y.—"Farrel Gearflex Couplings" is the title of a new bulletin, No. 437, describing the flexible couplings manufactured by this company. The bulletin contains diagrams and tables of ratings, dimensions, weights and list prices, as well as complete descriptive matter and information for ordering or inquiring for Gearflex Couplings. This piece of literature is of size to fit a standard binder and is attractively printed in two colors. Copies on request.

Ingersoll Steel & Disc Co., 310 So. Michigan Ave., Chicago—This company, a division of the Borg-Warner Corp., Chicago, has issued a folder illustrating many applications of IngOclad stainless clad steel. This new piece of literature contains installation views of tanks, pressure vessels, autoclaves, evaporators, and many other applications which indicate a wide use of the material in many different industries. Copies on request.

Kieley & Mueller, Inc., New York, N. Y. —Bulletin "C" contains general descriptive data on this company's Liquid Level Controllers, which are made with ball bearing spindles and easy-to-pack stuffing boxes. The advantages in design and construction of these controllers are brought out and illustrated with a large number of diagrammatic prints in color. There are also tables listing specifications for ordering, prices, etc. These controllers are used for accurate liquid level control, not only in tanks, but also in pipe lines, condensers, hot wells, open and closed feed water heaters and other vessels.

National Wood Fibre Growers Ass'n, Fernandina, Fla.—This organization has issued its first bulletin, addressed to the charter members of the association, but it is hoped that non-members will profit by the discussions contained therein. The bulletin is unique inasmuch as the information has been written up in dialogue form—a statement of ideas relating to foreign industry and marketing. This dialogue purports to be an account of a federal hearing, which is, of course, purely imaginary, but was arranged in this form by the association's president, J. H. Allen, with the thought that the questions involved could be most strikingly illustrated in this form. Copies may be obtained from the association offices.

Northern Equipment Co., Erie, Pa.—The Copes Catalog of Feed Water Regulators and Allied Equipment has just been released. The outstanding features and design of these regulators, their economical operation, and specifications are set forth. A large number of illustrations, and charts and diagrams in color add to the value of the text. Copies on request.

U. S. Department of Commerce, Bureau of Standards—A pamphlet known as Research Paper RP574, which is a part of Bureau of Standards Journal of Research, Vol. 11, July 1933, has just been issued. The subject of this pamphlet is "A Study of Some Factors Influencing the Strength and Stability of Experimental Papers Made from Two Different Sulphite Pulps." Copies may be obtained from the Superintendent of Documents, Washington, D. C., at five cents each.

BOOKS

Paper Making and Paper Selling—The special numbers of this British paper have always been well received, but the special number for 1933 is indeed one of the finest ever issued by this publication. The book contains 121 pages exclusive of inserts. The editorial material has been carefully prepared and all reader pages are interspersed with a very choice assortment of inserts of British paper and specialties. The specimens are confined to those of British manufacture. The typography of the book is worthy of mention and the book is one of which this well known publication may be justly proud.

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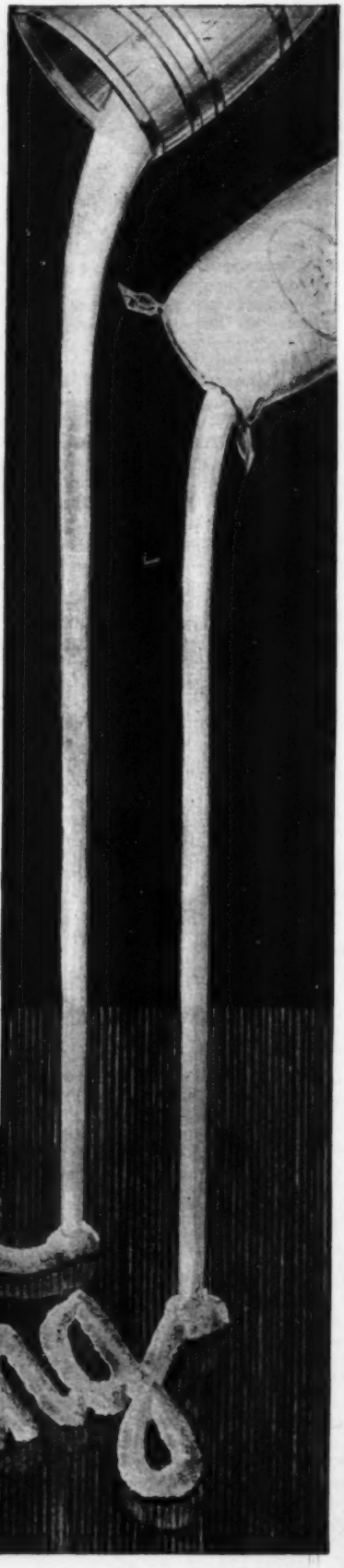

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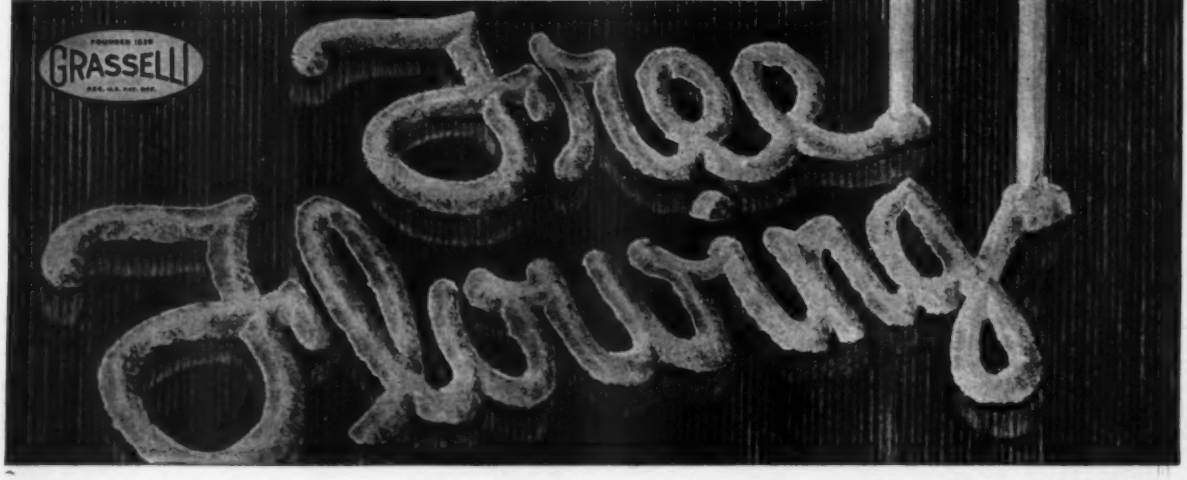


POWER

GENERATION + UTILIZATION + MAINTENANCE

This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worth while practices suggest new ideas and wider usages of equipment.

By W. S. JOULE

◆ How Air Is Removed from Feedwater

There has been much interest during the last few years in the matter of corrosion where piping and boiler and economizer tubes and plates are eaten away internally by chemical action even though water is free from all impurities except gases absorbed from the atmosphere. It is now well known that this destructive action is due to the dissolved oxygen in the water and that it can be prevented if the oxygen is removed from the water.

For the removal of this dissolved oxygen two general methods have been developed, both of which are in practical use. One of these is somewhat of a chemical nature and consists in the use of a degasifier which allows the water to come in contact with a mass of scrap iron or steel turnings. The oxygen attacks this scrap material, hence the water finally fed to the boiler is practically free of gas. Such a process is used in the Kestner degasser used mainly in Europe and the Speller process which is used in this country. This general method is employed in the deactivator.

De-aeration by reducing the partial gas pressure and increasing the water temperature is the second scheme which is used. Fundamentally, the process employed consists of heating the water to its approximate boiling point and then injecting it into a chamber under a vacuum.

◆ Spend to Save

Many power plants will not stand even a casual inspection. They operate as evidence that somewhere along the line of ownership and management there is a lack of understanding of the savings that can be made through the expenditure of moderate sums for first grade supplies and time saving equipment.

Cracks in boiler settings, warped fire doors, inoperative dampers, steam and water leaks are proof that indifference or neglect prevails. The problem is to find those responsible for these conditions and then drive home the facts in each case.

Plants as pictured above do not generally exist because the engineer on the job is negligent or ignorant; for invariably it will be found that his actions indicate that he is physically fit, his clothes show that he is the kind of man who gets right into the job and a brief conversation will prove that he is experienced and knows his business.

Where, then, can the responsibility be placed? In any number of cases it is the fault of the management because the engineer, always a busy man, is not provided with first grade supplies and time saving equipment and instruments. The engineer is too often spending much of his time in a fight to keep the plant operating at any cost rather than exercising his ability to improve general conditions and the economy of the plant. His job is made one of physical endurance rather than that of capitalizing for his employer through the use of his experience and brains.

Such equipment as feed water regulators, and flow and temperature recorders are time savers for the engineer. Packing and general supplies should not be purchased through the office on price considerations only. Consult the engineer and profit by his experience, for in this way the cost of supplies will be reduced; many hours can be saved both on maintenance and operation, with the result that the engineer will have time to study and effect worth-while economies.

You can profitably spend to save.

◆ Use of Draft Gauges

To secure the best possible furnace performance; i. e., the maximum obtainable efficiency at the desired capacity, requires that the draft in the ash pit, over the fire, and in the uptake, be controlled with considerable nicety. If this control is effected manually, it is essential that the fireman be kept informed at all times as to the draft conditions obtaining in his furnace. Should any change occur, he should know of it immediately and not have to wait until his pressure gauge or safety valve tells him what is taking place. This information can best be brought to his attention by the use of draft gauges.

For comparing the drafts at different points in the setting, two or more gauges are used, frequently mounted together on a single frame. The instrument may be so arranged that one gauge indicates the furnace draft and one the uptake draft or the differential between the grate and uptake.

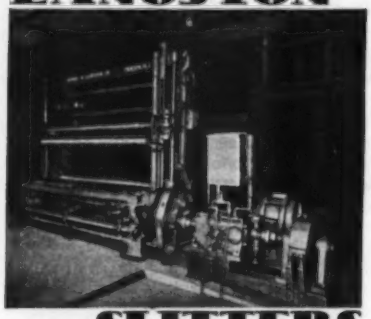
By running a series of tests on the boiler and furnace at various loads; changing the position of the damper, ash pit doors and over fire openings, if necessary; and the thickness of the fuel bed at each load, a series of draft and CO_2 readings may be obtained. There will thus be found a certain combination of drafts that will give the highest CO_2 without forming CO for every load. It will also be found that the relation of drafts will be about constant for all loads so that an index may be put on each scale to mark the points for best draft conditions at rated load. At other loads, the liquid level in each tube should be at equal distances above or below the indices for best results. Any variation from this relation will tell the fireman that all is not well in his furnace and further it will give him a good idea as to where the trouble is.

As an example of what the gauge will indicate: Both levels at the pointers show best efficiency at normal load. If both levels are raised by an equal amount an overload at best efficiency is indicated or if both are lowered an equal amount an underload at best efficiency is shown. When the damper draft decreases and the over-fire draft increases it is an indication of leaks in the baffling or clinkers or too thick a fire. In a hand-fired setting, this is the condition just after firing. After firing, the furnace draft will decrease and the damper draft will increase until an unbalance in the reverse direction occurs just before the next firing period. If this latter unbalance persists, it indicates holes in the fire or a thin fire or excessive slag and soot on the tubes.

◆ How to Clean a Fire

Fires should not be allowed to burn down too low before cleaning. If a thin fire is carried, it may be necessary to fire a reasonably heavy charge on one side and allow this to become well ignited before attempting to clear the fire. The side method in which one side of the fire is cleaned at a time is the most practical. To do this, take the slice bar and shove it along the side of the furnace on top of the clinker, pushing it almost to the bridge wall; then, using the side of the door jamb as a fulcrum, push the coal over to the other side of the grate. The hoe may have to be used to draw the coal forward from the bridge wall to where it can be conveniently pushed over with the bar. The clinker and ash should now be removed with a hoe from that side of the grate before being finally drawn from the furnace. The unburned fuel on the other side should now be transferred with the slice bar to the cleaned side of the grate, where it should be leveled off and fresh coal added. After this side becomes ignited, treat the other side in the same manner. While the fires are being cleaned, the dampers should be closed so that there is only enough draft to carry away the gases without an undue rush of air into the furnace.

LANGSTON



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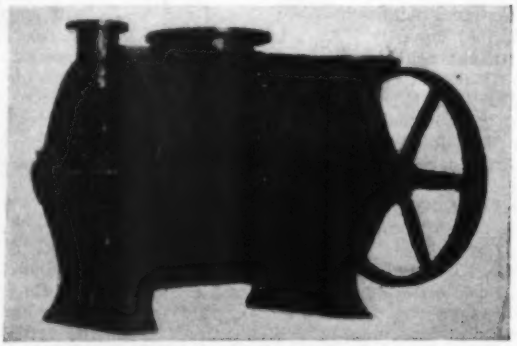

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◆ Progress in Smoke Abatement Summarized by Association

At the recent annual meeting of the National Smoke Prevention Association held in Chicago, Henry Kreisinger, a leading authority on combustion and related problems, summarized his views in a very interesting talk which concluded the meeting. Certain of his comments are quoted below which indicate the present status of smoke abatement work.

"Smoke abatement has come to mean more than the term implies; it means chimney emission abatement which includes not only the soot particles of which smoke consists but also fly ash and cinders. The meaning of the term is now being extended to include also the removal of sulphur compounds.

"It is fairly easy today to abate or reduce the nuisances of dust, cinders and smoke but we have not yet found an entirely practicable and satisfactory solution to the problem of sulphur removal, although substantial progress is being made in this direction.

"While pulverized coal firing causes the emission of more fly ash than stoker firing, the latter causes more cinder emission.

"The best way to eliminate soot from the flue gases is to burn the coal properly in the furnace.

"Both electrical precipitation and mechanical separation by cyclone are developed to a point where they are capable of removing at least 80 per cent of the dust from the flue gases.

"Standard designs of cyclones will give results that compare very favorably with recent special designs. They will remove over 80 per cent of the dust from gases containing only one-half of a grain of fine dust per cubic foot, with a pressure drop not exceeding three inches and with a fineness of the collected dust such that all of it will pass through a 300-mesh screen.

"Manufacturers of dust collection equipment, if given the opportunity to make more installations, which will give them additional experience, will shortly be able to assure at least 90 per cent separation.

"The cost of dust collecting equipment is not prohibitive. It will range from one or two up to five per cent of the cost of the plant, depending principally on whether it is included in the original design or installed after the plant is built.

"Sampling gases for the determination of dust content, while difficult, can be done to give results accurate within five per cent."

◆ First Chemical Industry Medal Awarded James G. Vail

The American Section of the Society of Chemical Industry has announced the institution of a new award to be called the Chemical Industry Medal which is to take the place of the Grasselli Medal, which has been awarded annually for a number of years by this society and which has not been discontinued.

The new medal is to be awarded annually to a person who has made a valuable application of chemical research to industry, primary consideration to be given to applications in the public interest.

The first award has been made to Mr. James G. Vail of the Philadelphia Quartz Company, Philadelphia, for his work on sodium silicates. The presentation was made at a meeting held November 3 at The Chemists' Club, New York City, the meeting held jointly with the American Chemical Society, the Electrochemical Society and the Societe de Chimie Industrielle.

The presentation of the medal was made by Prof. Marston T. Bogert of Columbia University. At the meeting, Dr. Walter T. Taggart of the University of Pennsylvania described Mr. Vail's work, and Mr. Vail himself delivered an address on the subject of the many new and varied applications of waterglass.

Mr. Vail is well known as the author of many articles dealing with the technology of the various forms of sodium silicate and also the methods by which silicate is made to serve industry.

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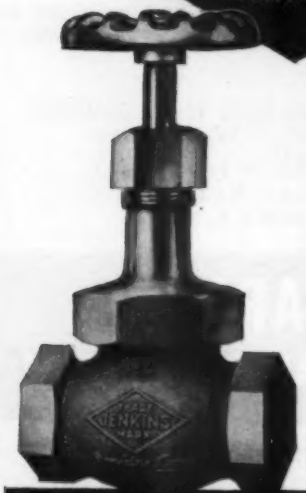

THERE is QUALITY in Fig. 106-A Jenkins Bronze Globe Valve—extra deep stuffing box—slip-on, stay-on disc holder — one-piece screw-over bonnet—Jenkins disc. It pays to insist on Jenkins Valves and the extra service that has characterized Jenkins quality since 1864.

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Fig. 106-A Globe, Screwed

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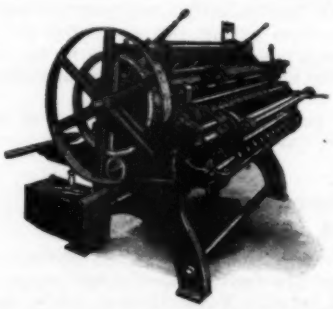

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July 1, 1933 to June 30, 1934

Scores of September 30 (cumulative)

29 Mills "Hit the Mark"

PERFECT SCORES

Division I—Paper and Pulp Mills

	PARTICIPANT	MILL	LOCATION
GROUP A	Hollingsworth & Whitney Co.	Algonquin & Taconnet	Winslow, Me.
	International Paper Co.	Otis	Chisholm, Me.
	The Champion Coated Paper Co.	No. 2	Hamilton, Ohio
GROUP B	Kimberly-Clark Corp.	Niagara	Wisconsin
	St. Croix Paper Co.	Woodland	Maine
GROUP C	Bryant Paper Co.	Paper Div.	Kalamazoo, Mich.
	Container Corp. of America	Coated Board Div.	Chicago, Ill.
	Bird & Son, Inc.	Norwood	Massachusetts
	Consolidated Water Power & Paper Co.	Appleton	Wisconsin
	Eastern Mfg. Co.	Katahdin	Lincoln, Me.
	River Side Paper Corp.	Appleton	Wisconsin
GROUP D	Southern Extract Co.	Chillicothe	Ohio
	International Paper Co.	Webster	Orono, Me.
	The Upson Company	Lockport	New York
	Hollingsworth & Whitney Co.	Aroostook & Cobbassee	Gardiner, Me.
	International Paper Co.	Continental Div.	Ashland, N. H.
	Bird & Son, Inc.	Phillipsdale	Rhode Island
	Bird & Son, Inc.	Chicago Roofing Plant	Chicago
	International Paper Co.	Livermore Falls	Maine
	Hollingsworth & Whitney Co.	Abenaquis Mill	Madison, Me.
	International Paper Co.	Riley	Maine
	Spaulding Fibre Co., Inc.	New Mill	Milton, N. H.
	Spaulding Fibre Co., Inc.	Hayes	Rochester, N. H.

Division II—Remanufacturing

	Bryant Paper Co.	Imperial Div.	Kalamazoo, Mich.
	Container Corp. of America	Anderson	Indiana
	Container Corp. of America	Natick	Massachusetts
	Texas Corrugated Box Co.	Dallas	Texas
	Southern Container Co.	Houston	Texas
	Bemis Bro. Bag Co.	East Pepperell	Massachusetts

IMPERFECT SCORES

	Key	Rank	Points Credit	Points Debit
GROUP A	PB- 9	4	902.312	
	PA-17	5	865.128	
	PB- 5	6	817.094	
	PA-11	7	744.152	
	PA- 3	8	701.832	
	PB-11	9	676.736	
	PA- 5	10	643.250	
	PA- 1	11	604.368	
	PA- 8	12	580.898	
	PA- 4	13	534.194	
	PB-15	14	469.272	
	PA-16	15	408.952	
	PB- 6	16	264.350	
	PA-14	17	264.008	
	PB- 2	18	12.776	
	PA-15	19		148.522
	PA-12	20		253.678
	PA-13	21		355.216
	PA- 9	22		408.936
	PA- 7	23		686.304
GROUP B*	PC-10	3	842.392	
	PB- 1	4	721.208	
	PB- 7	5	675.166	
	PB-12	6	663.624	
	PB- 3	7	616.102	
	PB-16	8	518.552	
	PC- 2	9	289.034	
	PC- 7	10	156.176	
	PB-13	11	86.344	
	PB-17	12		107.002
	PB- 4	13		241.014
	PC-18	14		379.694
	PB-14	15		1,111,066
GROUP C	PC- 9	7	798.328	
	PC-15	8	730.858	
	PD-28	9	710.016	
	PD-25	10	551.248	
	PC- 3	11	519.274	
	PC-23	12	262.584	
	PB-10	13	184.184	
	PD-13	14	172.762	
	PC-12	15	146.656	
	PD-17	16	1.074	
	PC-19	17		21.880
	PC-21	18		37.814
	PC- 8	19		69.302
	PC- 4	20		151.182
	PC-16	21		529.502
	PC-26	22		975.030
	PC-13	23		1,457.098
	PB-18	24		1,472,793
GROUP D	PC-20	13	598.906	
	PD-26	14	446.698	
	PD- 1	15	222.160	
	PD-20	16	98.974	
	PD- 7	17		238.578
	PD-14	18		841.462
	PD- 8	19		1,206.632
	PD-29	20		2,412,910
	PD- 2	21		4,724.272

DIVISION II

RA- 1	7	949.210	
RB- 1	8	888.462	
RC- 2	9	677.616	
RD- 5	10	647.632	
RC- 5	11	559.234	
RD- 4	12	268.382	
RD- 6	13		411.182
RD- 7	14		794.734

No August Report: PC-13.

No July or August Report: PD-21.

No July, August or September Report: PC-17, PD-22, PD-23; RC-3.

No September Report: PC-14; PD-11, PD-12

◆ AN OVERALL boiler plant efficiency of 82 per cent has been maintained for the past two years at the pulverized coal fired plant of the Anglo-Newfoundland Development Co., Grand Falls, Newfoundland. This plant was installed after an exhaustive engineering analysis of steam versus

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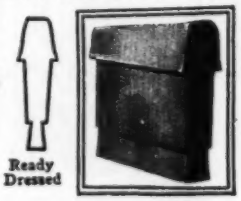

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hydro. It was finally decided that not only would the capital cost of this new boiler plant and the turbo-generators be very much less than the hydro-electric equipment, but the actual cost of electrical power at the mill switch-board would be about the same. (From *Heat Engineering*)

◆ Water as Fuel?

At a recent monthly meeting of the Marine Smoke Association of Hudson County, James McDonald, vice president of Todd Combustion Equipment Co., New York, made the statement that it was possible to burn water as fuel, and without smoke. He said that by mixing oil and water, experiments now being conducted show that the water can actually be burned as fuel at a saving of 17 per cent in oil consumption with absolutely no smoke.

It is reported that the process is patented with a mixture of 55 per cent oil to 45 per cent water. Heat efficiency of 83 to 85 per cent, and stack temperature of 100 degrees less than when burning straight oil.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of "The Paper Industry," published monthly at Chicago, Illinois, for October 1, 1933:

State of Illinois, County of Cook, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Edward B. Fritz, who, having been duly sworn according to law, deposes and says that he is the owner and publisher of "The Paper Industry" and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Edward B. Fritz, 333 N. Michigan Ave., Chicago, Ill.; Editor, Harry E. Weston, 333 N. Michigan Ave., Chicago, Ill.; Managing Editor, A. Scott Dowd, 333 N. Michigan Ave., Chicago, Ill.; Business Manager, Edward B. Fritz, 333 N. Michigan Ave., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Edward B. Fritz, 333 N. Michigan Ave., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

EDWARD B. FRITZ,

Sworn to and subscribed before me this 21st day of September, 1933.

[SEAL] JANE A. DeWITT.

(My commission expires August 1, 1936.)

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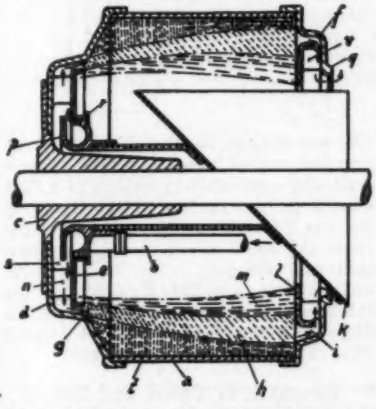
TECHNICAL DEVELOPMENTS

IN THE PAPER INDUSTRY ■ DOMESTIC AND FOREIGN

The following abstracts are of the latest developments found in the foreign press and in the patent offices. Photostats and translations of complete articles and patents can be obtained at cost price.

◆ Purifying Paper Pulp

The new centrifugal machine for purifying paper pulp is shown in longitudinal section in the accompanying illustration. It consists of a continuously rotating centrifugal drum (a), which is closed at one end and open at the other. A packed cover (f) is provided for this open end, the inner edge of which (q) serves as the drum overflow. The material to be purified is fed through (b), which opens out into a circular pipe (p). The cross-sectional area of the exit from this pipe is controlled by means of a disc (r). The circular pipe opens out into the chamber (s), which is formed of the back wall of the drum (d) and a circular disc (e) arranged at a certain distance therefrom. The impure pulp is



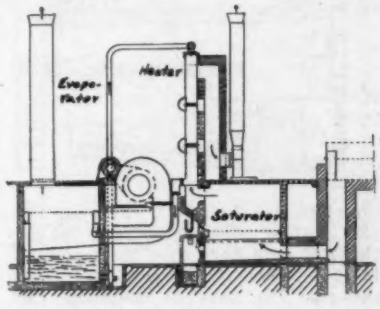
fed continuously into the apparatus through the inlet (b), from which it passes into the annular distributing pipe (p) and then flows into the chamber (s). Any bundles of fibers that may be present in the pulp are broken up by means of the baffles (n) in this chamber. The paper pulp is directed at the end of the chamber (s) through the annular space (g), as indicated by the arrows in the illustration. The direction of flow of the stock is now substantially parallel to the axis of the apparatus. Due to the action of centrifugal force the heavier impurities in the pulp are deposited on the periphery of the drum and the floating particles are moved closer to the axis of the centrifuge, while the paper fibers are forced to move through the liquid level (h) formed between the layer of floating particles (m) and the layer of slime (t). The speed of travel of the stock being centrifuged and the speed of the centrifuge itself are selected in such manner that the paper fibers travel through the layers of liquid only close to the exit point (i). The outflowing liquid carries the paper fibers along with it and flows with them over the overflow edge (q) into a container (o). Dr. G. ter Meer, Munich, Germany. German Patent No. 568,976.

◆ Chemical Mechanism of Sulphite Process

A thorough study was made of the relation between the lignosulphonic acids and the chemical mechanism of the sulphite digestion process. It was found that the sulphur and methylol content of the sulphonic acids formed, both in the solid phase and in solution, varies, the acid being obtained by dissolving the lignin in wood with acid sulphites and heat. The variation depends on the conditions of digestion. Lignosulphonic acids of high sulphur content in the solid phase are obtained with digestion liquors containing a large proportion of base and low hydrogen ion concentration. Digestion liquors, which contain low calcium content, do not sulphonate the lignin as effectively and yield low-sulphur containing lignosulphonic acids. The digestion liquors also influence the particle size of the dissolved lignosulphonic acid and its precipitability with sodium chloride, salts of aromatic amines, alkaloids, etc. The precipitation of lignosulphonic acid by these substances is esentially a salting-out effect. The portion of lignosulphonic acids, namely beta-lignosulphonic acid, not precipitated by naphthyline is very finely dispersed. In the main, it is not colloidally dispersed, as shown by its ease of diffusion through parchment membranes. It is further characterized by its high degree of sulphonation, its reducing action on Fehling solution, its property of loosely binding sulphur dioxide and its low methylol content. It does not contain carboxylic acid groups. The original methylol content of this portion of the lignin was the same as that of the total lignin, but half of its methylol content was split off in the cooking process. The splitting off could be due to a number of reactions, sulphonation, oxidation and hydrolysis. The property of the waste liquors to combine with sulphur dioxide loosely is due, mainly, to the sugars present in the liquors, but also in part, to the finely dispersed lignosulphonic acids. This loose binding of sulphur dioxide may be due to the presence of an aldehyde group in the aliphatic portion of the lignin or to the presence of a pyrocatechol residue, formed by splitting off methylol, which adds sulphite in the keto form. The solution of lignosulphonic acids from the solid phase is regulated by the hydrogen ion concentration, and should be considered as a hydrolytic reaction. The observations made on alpha-lignosulphonic acids and beta-lignosulphonic acids in the waste liquors do not indicate, necessarily, that alpha-lignin and beta-lignin are present in the wood as such. Erik G. Haegglund. Zellstoff und Papier, volume 13, 1933, pages 261 to 265.

◆ New Evaporating Process

The system, as may be seen from the accompanying illustration, consists of a saturator, heater and vaporizer. The saturator absorbs the combustion gases as they pass through the system. In order that the heat in these gases may be well utilized, it is necessary that water vapor should be absorbed by the combustion gases up to saturation. This is accomplished by sucking the combustion gases through a perforated bottom made of rustproof material, over which black liquor flows. The combustion gases are thus caused to absorb water vapor, until they are saturated. Since this water is derived from the water in the liquor, the latter is concentrated.

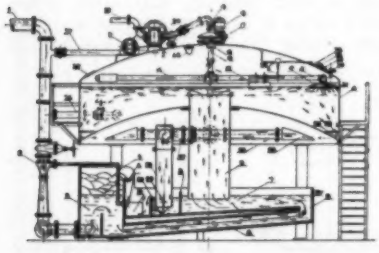


The saturated gases move from the saturator to the heater, which is likewise constructed of rustproof material, where they release their heat to the colder liquor indirectly and in countercurrent flow. Inasmuch as the gases are saturated at their inlet to the heater, hence indirect release of heat to the cold liquor takes place with simultaneous condensation of the water vapor. The condensate is removed at the bottom of the apparatus, while the used combustion gases leave at the top. The liquor which absorbs the heat of the saturated gases is fed to the heater at the top and leaves at the bottom. Then it flows under its own pressure to the evaporator, where it passes over a perforated bottom, which is like that of the saturator. Air, which has been previously heated to some degree, is forced through the perforated bottom. This permits intimate contact of the warm liquor, coming from the heater, and air. The latter is heated to the temperature of the liquor, whereat it absorbs water, which is released to

the atmosphere along with the air. The liquor is cooled on the perforated bottom by the evaporation of the water, and leaves the evaporator to flow into a tank located under the perforated bottom. The cold liquor is pumped back to the heater, where it flows in countercurrent with the saturated, hot gases. Anonymous. Zellstoff und Papier, 1933, volume 13, pages 156 to 157.

◆ New Save-All

The fibers contained in waste water rise to the surface, this being caused by air bubbles attaching themselves to the fibers. The new save-all is based on the fact that when a de-aerated sample is shaken, the fibers again become charged with air. This apparatus is shown in diagrammatic form in the accompanying illustration. The apparatus works as follows: The waste water is forced through the ejector (2) by means of a pump. This mixes the waste water with air. Strong foaming takes place in (3). The foam is collected in a compartment (4), from which it is sucked into the ejector through the conduit (5). The de-aerated water contains at the beginning a quantity of free air bubbles. These must be removed before the water reaches the riser pipe (9). This takes place principally in the pipe (6). The separated air rises to the surface of the



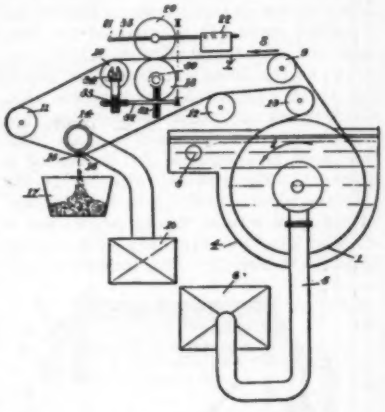
liquid in the shaft (B). Free air bubbles or those adhering badly to the particles of pulp have time to be released in (7). When the water rises through the pipe (9) into the container (A), practically only air, which is adhering to the fibers, is present. When the water leaves (9), the vertical movement of the particles of pulp is reduced to a minimum. The air-laden particles free themselves from the slowly moving waste water and rise to the surface of the liquid (AY). The water, freed from particles of pulp, sinks slowly to the bottom (24). The arrows show the flow of the waste water through the apparatus. The waste water finally flows out through the outlet pipe (25). E. Ernstler. Zellstoff und Papier, 1933, volume 13, pages 123 and 124.

◆ Kinetics of Sulphite Reactions

This lengthy article contains the results of a very comprehensive experimental study of the kinetics of reaction in the cooking of sulphite pulp. Digestion experiments were carried out in small autoclaves with calcium as base in the digestion liquor and with constant temperature (110, 125 and 140 degrees C.). Results indicated that the free sulpurdioxide is apparently the active component of the digestion acid, that the digestion temperature plays the principal role in the solution of cellulose and incrustating materials and that separation of lime salts takes place at the beginning of a black cook. The pentosan content of the chlorinated fibers is appreciable. The dissolving of the incrustating materials takes place in accordance with a reaction of the first order and the speed of the reaction is doubled with ten degrees C. temperature differentials. Digestion experiments with sodium as base gave the same general results both as regards reaction constants and temperature coefficient as the calcium digestion. Considerable whiter pulp was obtained in digestion with sodium sulphite liquor. Digestion experiments with aqueous sulphur dioxide without a base proved that the dissolving-out of the incrustating materials did not follow the laws of a reaction of the first order. Maximum dissolving-out of the incrustating materials is less than for normal digestion acids with the same total sulphur dioxide content, and decreases with rising digestion temperature. The cellulose is subject to stronger attack than in normal sulphite digestion, and the pulp always has a grayish color. In the digestion of sulphite pulp three separate processes control the solution of the incrustating materials from the wood: diffusion of the active constituents of the digestion acid into the wood, chemical reaction between these and the incrustating materials, diffusion of the reaction product from the wood. In the chemical reactions the temperature coefficient generally lies close to 2.0, that is, the speed of reaction is doubled for every ten-degree rise in temperature. On the other hand, as regards diffusion processes, the temperature coefficient is generally equal to 1.2 for the same temperature increase. Since a temperature coefficient of 2.0 was found for all digestion experiments, it may be concluded that the speed of diffusion is greater in digestion of sulphite pulp than the speed of chemical reaction. E. Stangeland. Papir Journalen, volume 20, pages 170 to 173, 193 to 197, 214 to 217 and 272 to 274.

◆ Cellular-Type Filters

The apparatus is shown in the accompanying figure and consists essentially of a drum (1), which rotates in the direction of the arrow. The liquid, to be filtered, enters at (2) into a box (4) which surrounds the drum and the filtered liquid is sucked off through the pipe (5) by means of a pump (6). A metallic, endless filter cloth (7) surrounds the drum (1) over almost its entire circumference. The cloth moves in the direction of the arrow (8) passing over the rollers (9, 10, 11, 12 and 13) and carrying along the deposit of material which accumulates on its surface as it passes through the box (4). In the course of its travel, the filter cloth passes by a distributor of compressed air. This is composed of a collecting pipe (14) which is connected with an air compressor (15), this pipe being arranged parallel to the axis of the drum (1). This pipe is provided with a longitudinal slot with appendages (16) which allow the pipe to approach more closely to the filter cloth without actually touching it. Compressed air thus comes closely in contact with the fibrous deposit on the filter cloth and the deposit is detached and caused to fall into a collecting device (17). Furthermore, the jet of compressed air cleans the filter cloth, removing particles of fiber which may have lodged more or less tightly in the meshes of the cloth. The movement of the filter cloth is controlled by an electric motor which also drives the rotating drum (1) through an intermediary speed-reducing device.



The motor is of the variable speed type provided with a rheostat which is automatically controlled by means of a float resting on the surface of the liquor in the box (4). When the level of liquid rises, the speed of the motor is accelerated and filtering speed is increased. This allows adequate control of the thickness of the film of fibers on the filter cloth (7). Societe E. et M. Lamort Fils. French Patent No. 748,663.

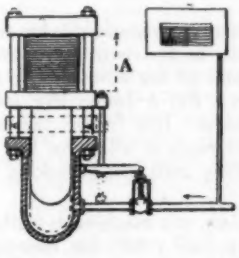
◆ Strength of Sheet and Sizing Unbleached Sulphite Pulp

The relation between the strength of the sheet and the method of sizing unbleached sulphite pulp was studied. Various proportions of aluminum sulphate and rosin size were used in the experiments. The tearing length of the paper sheet varied regularly according to the quantities of rosin size and aluminum sulphate used. Experiments were also made to test the effect of animal glue on the strength of the sheet. Numerous conclusions were reached of which the following appeared to be most interesting. The rapidity of the increase in strength at the initial stage of beating is dependent on the time of storage of the paper for one and the same undried pulp when stored in a moist atmosphere. Maximum speed of strength increase is attained after several months. The strength variation caused by the rosin sizing is dependent on the quantity of aluminum sulphate and rosin size used. The strength rises in each case with increase in the quantity

of aluminum sulphate used, but the rise is slow at first and when the quantity of sulphate used is great, the strength of the paper often drops sharply below that of the unsized paper. The same relation is found for addition of rosin size. The best strength is obtained with one to 1.5 per cent rosin and one to three per cent aluminum sulphate. The addition of three to five per cent of animal glue in normal rosin sizing causes a marked increase in strength. The addition of pine oil does not have any appreciable effect in increasing the strength of the paper sheet. This is quite different from its action on textile fibers. The use of animal glue alone increases the strength of short-beaten stock even when used in small quantities. It is adsorbed by the fibers only in small porportion. The quantity adsorbed, when all other conditions remain constant, varies with the degree of digestion of the stock, the degree of beating and other characteristics of the pulp fibers. The results are given in the original article in tables and charts. Dr. H. Ellern-Eichmann. Der Papier-Fabrikant, volume 31, 1933, pages 197 to 201, 209 to 213 and 222 to 226.

◆ Determining Moisture in Pulp

An apparatus for the determination of the moisture content of pulp is shown in the accompanying illustration. A quantity of the pulp of definite weight and area is pressed. The pulp is weighed



in a ball containing a number of sheets of pulp of like size, determined by actual measurement. The pressure and the thickness of the ball of pulp are measured so as to establish a relation between the pressure and the decrease in the volume of the ball. A. G. Karlander and J. A. A. Dahlberg. Sweden. Swedish Patent No. 76,029, filed February 13, 1929.

◆ Making Pulp

Pulp, containing 96 to 99 per cent of alpha-cellulose, is obtained by treating the crude pulp with a solution of an alkali sulphite containing 1 to 1.5 per cent of soda and 0.5 to 0.75 per cent of sodium sulphite. The treatment is carried out under a pressure of half to two atmospheres over a period of three hours. The pulp in a density of five to six per cent can be bleached with a solution of sodium hypochlorite, which is made slightly alkaline and which contains one to two per cent active chlorine. A slightly acidified solution of potasium permanganate may also be used for this purpose. Combined bleaching may also be used. The residual impurities are then removed by treatment with dilute sulphurous acid or dilute hydrochloric acid to obtain a very pure product. The pulp may be subjected to a second treatment with a solution of sodium sulphite at a pressure of half to one atmosphere for a period of one hour. F. C. Palazzo and F. Palazzo. British Patent No. 388,656, filed August 4, 1931.

◆ Paper From Sugar Beet Pressings

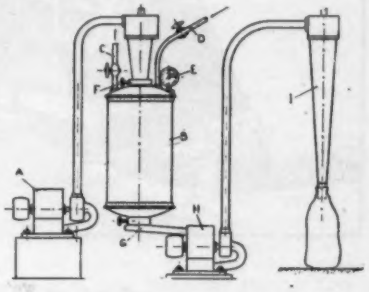
The pressings are taken from the diffusers, pressed and dried, or the residue left after the extraction from the pressings of the pectinic adhesive is treated under a pressure of 2 to 3 atmospheres in a kettle with a solution of milk of lime. The product is washed and crushed and added to paper pulp in various proportions. The operation is further carried out in the usual manner. M. S. Rudenko. Russian Patent No. 29,-703, filed November 29, 1930.

◆ Hemicellulose From Wood Waste

Wood waste from evergreens and also from leaf-trees was used. Birchwood waste lost 28 per cent of its weight on barking in a rod mill. Heating for four hours at a temperature of 100 degrees C. with 2.5 per cent sodium hydroxide gave a pulp yield of 65 per cent. Pulp yields of 83, 82 and 78 per cent respectively were obtained by heating unbarked birchwood, aspenwood and alderwood for eight hours with sodium hydroxide. Ten per cent of the latter was used based on the weight of the wood, the temperature of heating being 100 degrees C. The pulp obtained from alderwood was somewhat discolored. The ash, lignin and pentosan contents of the woods and the corresponding hemicelluloses are given in the original article. Hemicellulose was converted into cellulose by chlorination. Sprucewood gave yields of 70 to 77 per cent based on hemicellulose used, or 53 to 60 per cent based on the weight of barked wood used. Birchwood gave similarly 64.5 to 68.5 per cent or 54 to 56 per cent. O. Routala and J. O. Murto. Finnish Paper Timber Journal, 1933, pages 95 to 100.

◆ Making Mechanical Wood

Special grade of mechanical wood is obtained by grinding and pulverizing the wood after a preliminary oxidation treatment with an oxidizing gas, particularly ozone. Only a small amount of energy is required in the process as compared with the large consumption of energy in the usual process. The installation, shown in the accompanying illustration, comprises a grinder (A), a tank under pressure (B) which is provided with a safety outlet (C), a pipe (D) for feeding ozone into the tank, a manometer (E), an inlet valve (F), a lower discharge valve (G), a pulverizing grinder (H) and finally a cyclone bagging machine (I). The wood is fed to the first grinder (A) and the ground wood is carried by means of a current of air into the tank (B), which is hermetically sealed by closing the valves (F) and (G) after it is full. The tank (B) is then filled with ozone under pressure for a period of time required for the oxidation of the pulp, the duration of the treatment depending on the character of the wood. As soon as oxidation is sufficient for the purpose, the pressure within the tank is released by opening the valve (C) and then the lower discharge valve (G) is opened and the pulp is fed automatically to the grinder (H), which grinds the pulp to



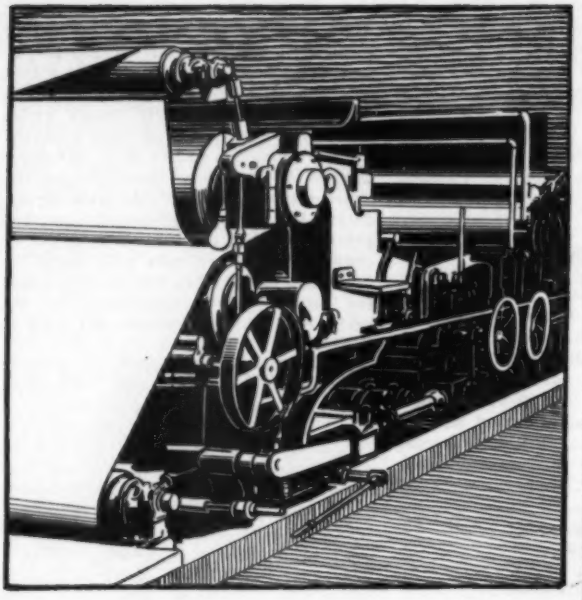
the required fineness and is also provided with suitable screens so that pulp of a definite degree of fineness passes through and is drawn into the cyclone bagging machine. A mechanical wood, dry and ready for manufacture into paper, is thus obtained. Gaston-Amendee Mourlaque. French Patent No. 745,717.

◆ Sulphite Pulp

Wood chips are digested first with hot aqueous solution of sodium bisulphite. Some of the liquor is then removed and other liquor, which contains an excess of sulphur dioxide, is added. The digestion is then completed. Forced circulation and indirect heat are employed. Patentaktiebolaget Groendal-Ramen. British Patent No. 384,455, filed January 9, 1931.

◆ Hydration of Cellulose

Evidence is adduced to substantiate the theory that the strength of paper made from wood pulp is probably almost independent of fibrillation. Photomicrographs are given in support of this contention. By the time that the fibrillation has become appreciable, strength has reached a maximum and may be even falling off. Fibrillation, which is produced during beating, is regarded as incidental. It is concluded that the main changes taking place are the imbitition of water by the colloidal fiber envelope, and a change in the nature of the fiber surface promoted by the pressure of the beater roll. These changes affect the pliability of the fibers, thus enabling the pressure to which the moist web of paper is subsequently subjected to compress the fibers to a greater extent, so forming a denser sheet having a greater area of contact between the fibers. H. A. Harrison. Proceedings of the Technical Section Paper Makers Association, volume 13, pages 18 to 25.



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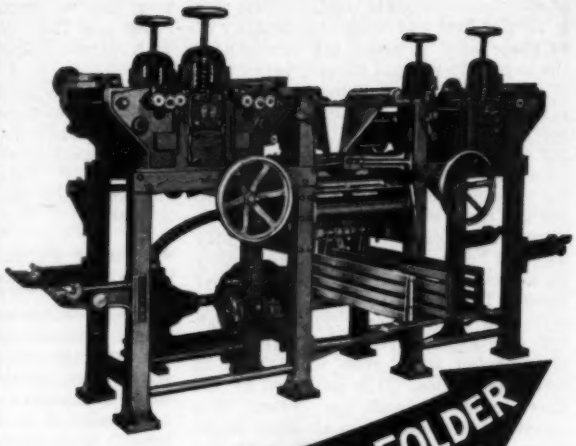

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The COMMERCIAL OUTLOOK

New York, November 1, 1933.

STATISTICS compiled by the Federal Reserve Board, branches of the Government and other statistical bureaus show a steady improvement in the general industrial and business situation. Employment continues to increase, industrial activity is holding up comparatively well, carloadings are running far ahead of a year ago, wholesale and retail trade is registering gains—the statistics indicate, in fact, that basically business is on the mend, and that the comprehensive efforts of the Federal Government to revive industry and trade are meeting with a fair degree of success.

On the other hand, there are signs of a somewhat individual nature that activity in many branches of manufacturing industry—and including the paper industry—has let down to some extent. Perhaps this is due to the cautiousness of buyers, perhaps to the lull that might be expected to follow the period of sudden and broad market activity several months ago, perhaps it can be attributed to apprehension on the part of manufacturers as well as distributors and even consumers pending the full working out of all the major moves the Washington Government is making with a view to rehabilitating the business and financial structure of the country. Nevertheless, taking the reports of a large majority within the industry as a basis for the statement, it is evident that demand for paper has simmered off to an extent, that mills are not as busy as they were in most cases, that the flow of supplies from manufacturing centers into avenues of consumption has let down, and that the market has unquestionably developed a quieter tone.

Despite this situation, which is regarded in the trade as temporary, the outlook for the paper manufacturing industry is declared to be more favorable than at any time since 1929, based on a survey of the industry made by the firm of Dun and Bradstreet, Inc., with most paper producing and distributing concerns in better financial position and profit-making possibilities decidedly enhanced by closer cooperation as a result of code adoption.

"Prices," says the credit agency survey, "have been advanced all along the line but the mark-up has been less than in some other industries. Those items which had become demoralized were the first to be raised, and include kraft, kraft bags, gummed tape, sulphite bond, the lower grades of stationery stock, some of the book papers, and many materials. Prices in general have been increased from 5 to 60 per cent, with the largest mark-ups in corrugated paper boxes, wrapping paper, and industrial grades."

The opinion is common within the industry that paper manufacturing and marketing is on the threshold of a period of broad activity. It is generally recognized that consumers, converters and jobbers bought heavily, and far in excess of their current requirements, during the early summer season when a spurt in buying of practically all commodities occurred. Obviously, it will take time to work off the stocks accumulated, but the feeling is that stocks have been substantially reduced in recent weeks, and that once the various industries are functioning under their respective codes and all in each industry cooperating and working with one end in view—that of improving business, increasing employment and enlarging the buying power of the national consumption of paper of all classes will mount, demand will widen and orders will flock into mills at a rate necessitating production on a near-to-capacity level.

Mills' output is running well ahead of last year. Latest available figures, compiled by the American Paper and Pulp Association from identical mill reports, show that the daily average production of all grades of paper in July was above that of June this year, with the exception of newsprint and paperboard, which showed less than one per cent decrease, and tissue, which showed slightly more than one per cent decrease from the June, 1933, level. All grades of paper showed higher daily averages of production than in July a year ago. The total production of paper at the end of July last was 3.2 per cent above the level of the first seven months' total of 1932. The total shipments of all grades for the seven-month period this year were 3.7 per cent above the corresponding period of 1932. Total paper stocks at mills at the end of July were 20 per cent below the level of July, 1932, bag paper being the only major grade showing an increase over last year.

Newsprint manufacturers of the United States, Canada and European countries have agreed to a price armistice as a result of conferences called in Washington by General Johnson. A majority of interests present at the conference agreed to proposals of C. R. McMillen, of the St. Regis Paper Company, whereby prevailing prices will be upheld through the end of next year, including a delivery price of $40 a ton in New York and Chicago. The conference agreed not to fix any delivery price where delivery would take place after 1934. This action on the part of newsprint producers will likely lead to a "frozen" price at $40 per ton for newsprint. At any rate, it will forestall further price cutting and the collapse of the newsprint industry on this Continent. Assurances have been received from large newspaper publishers that the $40 a ton price will be acceptable.

Some groups of paper manufacturers are enjoying fair market activity. The gain in magazine advertising within the last few weeks and the consequent expansion in the size of publications has caused a moderate increase in sales of book paper, and orders are running 10 to 15 per cent ahead of the same time last year and are helping to deplete the fairly large volume of stocks which overhung the market. Prices have strengthened and are enabling producers to cover most of their charges. Wrapping paper demand has shown an upturn, and most mills are well engaged. Fine papers, more especially sulphite bonds, are in decidedly better call, and prices, reflecting the strong position of raw material, display firmness. Boxboards are quieter after several months of brisk demand, yet mill quotations are fully sustained on the top levels attained some time ago.

❖ ❖ ❖

◆ Report Activities of Import Committee

A report by Warren B. Bullock, Manager of the Import Committee of the American Paper Industry, gives a list of twenty-three cases of importations of foreign paper on which the Customs Officials have held the imported merchandise to have been misclassified.

Officials at Buffalo have held a large shipment of Mandarin colored paper imported as standard newsprint to be dutiable as printing paper and have collected duty accordingly.

A test case involving the dutiable value of candy box padding has been finally decided by the United States Customs Court which holds that importations from Germany in 1929 were undervalued nearly 20 percent. The case was decided adversely to the American interests in 1931, after trial in 1930. With the assistance of the Import Committee the case was appealed for review, the importer again sustained, and then appealed to the United States Court of Customs and Patent Appeals. Here, the original finding of undervaluation was sustained, the case remanded to the lower court for a finding of correct value, and a decision rendered upholding the original finding of undervaluation and finding the dutiable value to be that of the appraiser when the case first arose.

◆ THE LOUIS ALLIS CO., Milwaukee, Wis., announces the establishment of a branch office at 4402 Kathland Ave., Baltimore, Md., and the appointment of Wallace I. Cousins as representative in charge.

Domestic RAW MATERIALS

◆ Papermaking Rags

While wood pulp and such other virgin materials as paper manufacturers use have continued to display pronounced price firmness, the recent trend in secondary raw materials has been—almost without exception as regards the numerous classes of waste products consumed in the making of paper and board—in favor of buyers. With demand subsiding, available supplies on the increase, and prices sagging, the market has developed into a strictly buyer's market, and paper mills have been occasioned no difficulty in getting the raw stock needed and at prices generally at the low edges of quotational ranges.

The market situation in papermaking rags has gone from quiet to dull; in fact, there is at present very little activity in any part of the rag trade. Consuming mills evidently have filled their requirements for a time and are keeping almost entirely out of the market; demand is of very spasmodic character, and even when paper manufacturers enter the market to buy they limit their orders in a great majority of cases to small parcels of rags. The down-trend in prices seems due almost solely to the dearth of worthwhile demand; there are numerous indications that supplies of many grades of rags suitable for paper mills are far under normal, but this factor cuts little figure with consuming demand as restricted as it happens to be now.

Dealers contend the production of new cuttings of most grades is far below customary tonnage, yet prices of these rags have tended downward as a direct result of limited mill demand. No. 1 new white shirt cuttings are quoted in most trade quarters at 6.75 cents per pound f. o. b. shipping points, but it is likely purchases are being made at slightly under this price. Similarly, new unbleached muslins are quoted at 7 cents, light silesias at 4.75 cents, fancy shirt cuttings at 2 cents, light flannelettes at 5 cents, No. 1 washables at 1.85 cents, blue overall cuttings at 4.25 cents, bleached canton flannels at 5.75 cents and black silesias at 3 cents, yet it is very probable some of these rags are being purchased by mills at recessions from these prices. New linen cuttings are in relatively good demand and firm at about 10.50 cents a pound for white, and 8.50 cents for grey linen at dealers' shipping points.

Felt mill buying of roofing rags has simmered off to almost nothing, and, as usually is the case when the market slows down for these rags, prices have moved lower. In the East, No. 1 domestic roofing stock is selling at 70 to 75 cents per hundred pounds at shipping points, and No. 2 quality at 60 to 65 cents. Foreign dark cottons are nominally 85 to 90 cents ex dock New York though importers say such rags cannot be obtained abroad to be sold to mills here on this price level because of higher markets in countries of origin. Old white cottons and thirds and blues are neglected by paper mills, and prices are largely a nominal matter at approximately 2.75 to 3 cents per pound for No. 1 repacked whites, 2 cents for No. 2 repacked whites, and 1.25 to 1.50 cents for repacked thirds and blues. In the old days papermakers used large quantities of old white and blue cottons, but apparently these rags have been supplanted by new cuttings.

◆ Old Paper

Seemingly, the bottom has dropped out of the market for old mixed waste paper, and the crash in prices of this basic grade of old paper has been attended by declines in other grades. The reason for the debacle in the mixed paper market is nothing else, according to all accounts, than that boxboard mills have retrenched in their buying to such an extent that supplies have backed up in big tonnage and sellers have figuratively fallen over themselves to market such material, almost irrespective of price. No. 1 mixed paper is selling in the East at 30 cents per hundred pounds f. o. b. New York, and it is not improbable purchases have been effected by board mills at less than this price, which constitutes a very sharp drop from a level of 75 and 80 cents prevailing only a comparatively short time ago.

Folded news is down to 45 cents per hundred pounds in the East at shipping points, boxboard cuttings to 35 cents, old corrugated boxes to 40 cents, crumpled news to 40 cents, and overissue news to 75 cents. The higher grades have eased also. Book stock is off to 90 cents a hundred pounds f. o. b. eastern shipping points for No. 1 heavy books and magazines, No. 1 hard white shavings are reported available at 2.25 cents a pound, No. 1 soft white shavings at 2 cents, one-cut soft white at 2.25 cents, and No. 1 hard white envelope cuttings at 2.60 cents. Old kraft paper is relatively steady at 1.10 cents a pound, as are white blank news cuttings at 1.25 cents, and white ledgers at 1.25 cents per pound.

◆ Pulpwood

Pulp manufacturers are absorbing supplies of wood in a fairly steady manner, yet demand is not of sufficient scope to have influence on ruling market prices other than sustaining them on about unchanged levels. Quotations in the up-state New York consuming district are $12 a cord for four-foot peeled wood, $14 for hand-shaved and $16 for two-foot rossed wood.

◆ Rope and Bagging

Evidently paper mills have accumulated sizable stocks of old rope, and are now doing very little additional buying. Demand, in fact, is slow indeed, and while dealers and importers quote about unchanged prices, there are signs they are accepting lower figures in some cases. The market lacks established levels, so it is difficult to say just what prevailing values are. Domestic No. 1 old manila rope is available at 2.50 cents per pound f. o. b. dealers' shipping points, and perhaps less, while No. 1 foreign old manila is offered at 2.35 cents ex dock New York. Importers assert it is becoming increasingly hard to buy abroad at recently ruling costs owing to advancing exchanges. Old bagging is also largely under neglect of paper mills, and market rates exhibit a sliding tendency.

◆ Mechanical Pulp

Not a great deal of activity is noted currently in the groundwood market, but reports tell of a steady movement of supplies from producing to consuming centers against old orders. Consumers who bought quite heavily sometime ago are now managing to get along with supplies coming in without having to resort to additional purchases; moreover, plentiful water in pulp mill streams also has led to a decrease in demand from consumers who are enabled to operate their own grinding plants. Prices of groundwood are steady, chiefly as a result of a firm supply condition. Domestic and Canadian pulp is bringing in the vicinity of $35 per ton delivered paper mills, depending on the haul from producing centers. Canadian manufacturers are securing $21 and $22 and up for groundwood f. o. b. their mills.

◆ Chemical Pulp

There are indications aplenty that domestic pulp mills are well sold up and that they are not keen about entering further sales commitments while prospects favor higher market prices. A firm tone marks prices; in fact, any changes that have occurred recently have been in an upward direction, and reports are additional advances are pending. Most domestic producers are quoting at least 3 cents per pound, ex dock Atlantic seaboard basis, for bleached sulphite, and it is not unusual for higher than this price to be asked on some mill brands. Unbleached sulphite is 1.75 to 2 cents a pound f. o. b. pulp mills, and bleached soda pulp is 2.50 cents delivered book paper mills with talk of another $5 a ton increase in the latter pulp being considered. Kraft pulp is 2 cents or more a pound at pulp plants for No. 1 eastern kraft, and 1.75 cents for southern kraft.

◆ Chemicals

Little change is reported in quotations on papermaking chemicals. Casein is 14 to 15 cents per pound for the domestic product and 14 to 14.50 cents for Argentine casein, depending on the grind. Soda ash is steady at 1.30 cents for bag shipments at works, and caustic soda is 2.55 cents up for the solid product. Sulphur prices are from $18 to $20 per long ton at mines.

Import and Export MARKETS

IMPORTS

◆ Wood Pulp

A decidedly firm tone marks prices of imported wood pulp. Demand is fair; paper and board manufacturers in numerous instances display readiness, if not eagerness, to add to their supplies or purchasing commitments, and there is no doubt a good deal more business could be done were the pulp necessary for trading purposes available in the market. The salient factor in the market situation is the sold-up position of producing mills, in various parts of Europe. A large majority of pulp mills in Scandinavia and elsewhere on the other side of the Atlantic are completely sold out for the remainder of this year, and in many cases well into next year, and because of the uncertainty created by violent exchange gyrations and because of the feeling common within the trade that higher prices on pulp are to be seen there is little disposition to sell further ahead.

Inquiries are coming into the market from consuming quarters in good number and for sizable tonnages of foreign pulp. In most instances, importers and agents in New York are unable to fill these wants of pulp buyers for the simple reason their principals abroad do not wish to make sales, not for the present at any rate. The tight supply condition is particularly noted in bleached sulphite, of which the available supply is small decidedly; the supply position of kraft pulp also is very strong, with many of the mills in Sweden producing those brands of such pulp best known in the United States outsold, and while there is unbleached sulphite to be had, offerings from manufacturing sources abroad are at best limited and some mills making this class of chemical pulp are sold up. As would be expected under these circumstances applying to the supply side of the market situation, prices are firm indeed; the tendency in quotations is upward, and higher market levels appear in prospect.

A glance at figures covering importations of wood pulp into the United States in recent months tells in a measure the story of the sold-up position of European pulp mills. American consumers have bought pulp heavily in Europe during the past few months, and their large purchases are reflected in the big increase in pulp imports into this country. Latest available statistics, issued by the U. S. Department of Commerce and covering the month of August last, show that a total of 173,787 long tons of chemical wood pulp, valued at $5,906,775, was imported into the United States in that month, which quantity comes close to establishing a new high record of pulp importations into this country in any one month. The August imports exceeded the 159,463 long tons of a declared value of $5,283,519 imported in the preceding month, which showed a large gain over the 122,518 tons of a value of $4,020,995 imported in June last. The August imports were far more than double the receipts in the similar month of 1932, which amounted to 65,822 tons of a value of $2,574,430.

These large shipments of pulp from Europe to the United States mean that producing mills on the other side of the Atlantic have disposed of their output for this year, especially since they are operating under ironclad agreements restricting production. Total imports of chemical pulp into the United States during the first eight months of the current year reached 866,419 long tons, valued at $29,736,337, contrasted with 720,587 long tons of a value of $28,088,721 in the corresponding period of 1932. Groundwood imports in August were 19,066 long tons, valued at $344,432, making a total for the first eight months of this year of 100,491 long tons of a value of $1,716,846, against 98,512 tons of a value of $2,009,112 in the same time last year.

◆ Paper

Imports of paper into the United States fell off in point of total value during August as compared with the month preceding, reaching an aggregate value of $6,541,721, according to official U. S. Department of Commerce statistics, against $7,039,154 in July last. Eight months' importations this year were valued at $47,921,385, contrasted with $67,640,576 a year ago. Standard newsprint, to the value of $42,739,274, was the principal item of import in the first eight months of this year, with cigarette paper to the value of $1,883,354 the second most important class of paper imported.

◆ Paper Stock

Imports of rags for papermaking into the United States in August showed a decrease from the quantity imported in the preceding month but were on a comparatively large scale and were far above the importations in the same month last year. August receipts totaled 29,435,573 pounds, valued at $245,629, contrasted with 33,319,061 pounds of a value of $230,286 in July last, and 7,241,124 pounds of a value of $100,196 in August, 1932, making a total for the first eight months of this year of 102,692,069 pounds, valued at $771,181, compared with 64,094,105 pounds of a declared value of $854,333 in the similar period a year ago, according to U. S. Department of Commerce figures. Imports of miscellaneous paper stock, comprising old rope, bagging, waste paper, etc., in August were 13,626,511 pounds of a value of $157,753, contrasted with 17,108,565 pounds of a value of $147,216 in the preceding month, 4,521,121 pounds of a value of $54,404 in the same month last year, and making a total of 68,495,278 pounds of a value of $671,271 for the first eight months of the current year, against 60,025,989 pounds of a value of $528,534 in the same period of 1932.

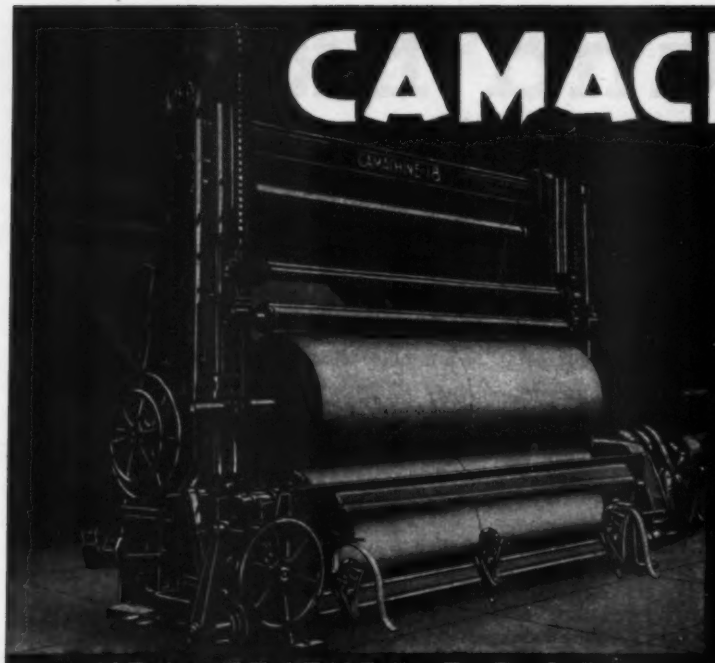
EXPORTS

After showing a forward trend for several months, exports of paper and paper products from the United States registered a slight decrease during August as compared with the preceding month from a total value standpoint. According to official figures compiled by the U. S. Department of Commerce in Washington, exportations in the month of August last reached a total value of $1,152,788, contrasted with $1,259,668 in July this year, and $1,168,649 in August, 1932. Exports during the first eight months of the current year were valued at $8,955,296, against $10,905,608 in the corresponding period of 1932.

Exports of newsprint paper in August this year were 1,283,806 pounds of a value of $27,133, making a total for the first eight months of the year of 12,719,018 pounds, valued at $252,293. Exports of uncoated book paper in the first eight months of this year amounted to 11,216,983 pounds of a declared value of $518,010, while writing paper shipments reached a total of 7,905,416 pounds for a value of $525,402 in the eight-month period, and wrapping paper exports were 15,996,476 pounds of a value of $806,166. Exports of tissue and crepe paper in the eight months amounted to 2,475,266 pounds, valued at $350,586; of sheathing and building paper, 3,958,892 pounds, valued at $98,138; of cover paper, 538,429 pounds, valued at $68,210, and of blotting paper, 1,013,462 pounds, valued at $92,507. An item of importance was old and overissued newspapers, shipments of which aggregated 84,499,616 pounds of a value of $557,348 in eight months. Boxboard exports were valued at $569,304, and other paperboard $419,950. Paper bag exports reached a value of $359,759; paper boxes, $299,655.

Exports of paper base stocks, comprising wood pulp, rags, etc., were valued at $2,154,322 in the first eight months of this year, against shipments of a value of $1,855,191 in the same period of 1932.

CAMACHINE 18



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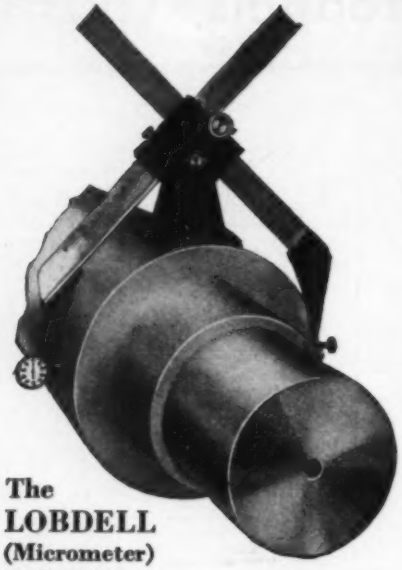

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Indispensable Instrument
will return profits through the improved quality of your product

The Lobdell Micrometer Roll Caliper is easily adjusted to varying diameters—light in weight and easy to read.

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97 Years in Business
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Satisfying performance
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Standard Routine Tests Developed by LaMotte Research Department Promote Better Control in Maintenance of

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—Prevention of Corrosion of Boilers, Machines and

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- in the Sizing
- in Filling, Coating and Coloring
- in Eliminating Deposition of Pitch on Wires, Rolls and Felts
- in White Water Recovery
- in Quality of Mill Water Supply
- in Finished Paper

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Hardness . . . Phosphates
pH . . . Sulphates

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Taylor Instrument Co.

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Love Brothers, Inc.

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Taylor Instrument Co.

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Moore & White Co.
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Link-Belt Company

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Holyoke Machine Co.
Rodney Hunt Mach. Co.
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E. D. Jones & Sons Co.

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Carthage Machine Co.

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Moore & White Co.

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Moore & White Co.
Smith & Winchester Co.

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Grasselli Chemical Co.

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Enterprise Machine Co.
Hudson-Sharp Mach. Co.
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Carthage Machine Co.

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Link-Belt Company

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Corn Prod. Refining Co.

Steam Meters
The Bristol Co.

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Strainers
Carthage Machine Co.

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Moore & White Co.

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Tensile Strength & Stretch Testers
B. F. Perkins & Son, Inc.

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Taylor Instrument Co.

Thickness Control (Paper)
Enterprise Machine Co.

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Holyoke Machine Co.
Rodney Hunt Mach. Co.

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Turbo-Pumps
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Duriron Co.
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Valves (Gate)
Enterprise Machine Co.
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Smith & Winchester Co.

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Downingtown Mfg. Co.
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Winders
Cameron Machine Co.
Downingtown Mfg. Co.
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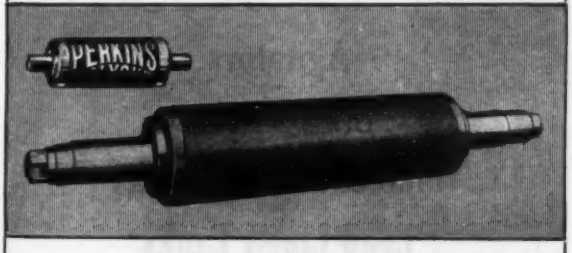
Smith & Winchester Co.

Wire, Steel (Plain or Coated)
J. T. Ryerson & Son, Inc.

Wood Grapples
Link-Belt Company

PERKINS
Granite Press Rolls



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SPECIAL
Paper Starch

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AMERICAN SHEET AND TIN PLATE COMPANY PITTSBURGH

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THE PERKINS TENSILE TESTER

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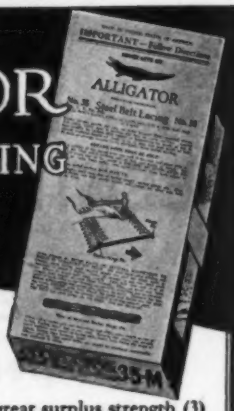

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Agitators
Stuff Chests
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Lead Lined Tanks
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(Wood or Steel)
Blow Pits
(Including the Patented Elliptical Blowpit)

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CINCINNATI O U S A

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ANTICIPATION OF FUTURE NEEDS OF THE INDUSTRY

TENAX Felts are going forward anticipating the requirements of tomorrow.

TENAX Felts are abreast of the ever changing times.

Order your TENAX Felts at once to be sure you have them in stock to meet the demands of the new Finishes and High Speed Operation of today and the future.

TENAX Felts give you the Service and Finish you expect.

Non-Users Are the Losers

LOCKPORT FELT COMPANY

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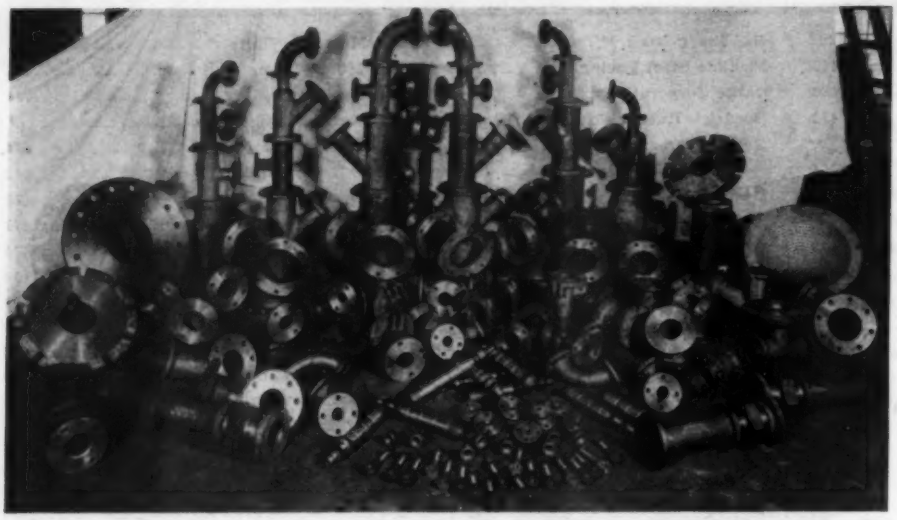
MISCO "C" Fittings
insure corrosion free operation



These MISCO "C" fittings will be used on six digesters now being equipped with a Chemipulp hot acid system; part of a recent shipment of fittings to an eastern sulphite mill.

In every case where MISCO "C" the corrosion resisting alloy has been specified by manufacturers, or users of equipment exposed to the action of sulphite liquor, it has never failed to fulfill the most exacting requirements. This dependability is the result of long engineering experience and correct production practice.

We will be pleased to make up MISCO "C" fittings from your design, redesign your present equipment, or submit designs for your specific needs.

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1992 GUOIN STREET, DETROIT, MICHIGAN

Is *Your* Safety Program Paying *Maximum* Dividends?

DURING the 1931-32 Paper Industry Safety Contest, nine paper, pulp, bag and container mills completed the 12 months' period *without a single lost-time injury*—an aggregate of two and one-half million man hours worked safely. These mills furnish nine perfect illustrations of the maximum dividends to be reaped from a successful safety program.

Similarly, in the Paper and Pulp Section of the National Safety Council, 100 companies that have reported experience over a five-year period can point to a reduction of *one-half* in accident frequency and severity rates, as the dividends paid by their safety programs.

In 1933, every company in the industry should follow the lead that Safety offers to reduce accident costs. The National Safety Council will gladly outline, without obligation upon request, the methods any company can adopt that will result in this desired cost reduction.

National Safety Council
INCORPORATED

20 North Wacker Drive Chicago